



PRICE BID TENDER DOCUMENT.

**TENDER NOTICE NO.
HY/ES/CIE/CONT/ACPCPL/09**

CIE jobs of Erection, Testing, Pre commissioning & Commissioning of 1 x 43 MW STG at Arasmeta Captive Power Company Private Limited, Arasmeta, Dist Jangir-Champa, near Bilaspur , CHATTEESGARH.

**TENDER(TECHNICAL &PRICE BIDS) Submission:
On or before 14.00 Hrs. on 10-09-2009**

**TENDER(TECHNICAL BID) OPENING:
14.30Hrs.on 10-09-2009**

**TENDER(PRICE BID) OPENING:
14.30Hrs.on 19-09-2009**

**EXTERNAL SERVICES DEPARTMENT.
02 ANNEXE, II FLOOR
BHARAT HEAVY ELECTRICALS LIMITED
RAMACHANDRAPURAM, HYDERABAD-502032 (A.P.)
Phone: 040 - 23185082/5145/4497.
FAX NO: 040:23186041**

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TENDER SCHEDULE

(Arasmeta Captive Power Company Pvt. Ltd.)

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Spec. No.201

PROJECT INFORMATION

Installation Testing & Commissioning of Control, Instrumentation and Electrical Jobs are to be carried for 1x 34.5 MW Steam Turbine Driven Generator Set at M/S Arasmeta Captive Power Company Pvt. Ltd., Dist. Janjgir- Champa, Chattisgarh.

PROJECT DATA

1. Project Authority : M/S Arasmeta Captive Power Company Pvt. Ltd.
 2. Project Consultant : DCPL
 3. Name of the Project : M/S Arasmeta Captive Power Company Pvt. Ltd.
 4. Location of Site : M/S Arasmeta Captive Power Company Pvt. Ltd.,
Dist. Janjgir- Champa, Chattisgarh.
 5. Nearest Rly Station : Bilaspur
 6. Nearest Air Port : Raipur
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SIGNATURE & SEAL OF BIDDER

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Spec. No.202

SCOPE OF CONTROL, INSTRUMENTATION AND ELECTRICALS JOBS

It is not the intention in this specification to specify each and every activity in the scope of work. However broadly they are brought out in this section and specification nos. 101, 102 & 103 of this Tender Schedule. Bidder may kindly note the same. For the completeness of the job, bidder to note that, all activities of erection, testing and commissioning should be completed. Any minor modifications including strengthening by additional welding etc., if required on the equipment to be erected shall be considered as part of the erection and shall not call for any extra payment.

- 1.0 Bidder shall quote "FIRM" Prices only. The terms of payment will be operated based on Specification 205 & 205A.
- 2.0 Service taxes will be paid extra as per the prevailing government rate on submission of necessary documents.
- 3.0 Bidder should note at least 50% of security deposit is to be paid before start of work. Balance security deposit can be recovered at the rate 10% from running bill
- 4.0 Receipt Inspection, Storage and drawal' of Materials at site:
 - 4.1 After the materials (Instruments and associated materials) are received at site, the contractor shall identify them with reference to the completion schedules and relevant part lists and tag every item with the concerned tag number by reference to P&I diagram. Any clarifications/assistance required for identifying the items will be extended by the BHEL Site Engineer. Insts. body(not the cover) shall bear tag no. by paint.
 - 4.2 All the items shall be stored, after tagging, in separate locations service wise.
 - 4.3 Temporary sheds required for the storage of these items shall be constructed by the contractor. Storage of these items shall be done in such a way that these can be reached and retrieved easily and conditions for storage are good, to the satisfaction of BHEL site engineer.
 - 4.4 Materials drawn from BHEL/Contractor's stores shall be transported to Installation site as and when required. The contractor shall make proper arrangements for transporting these materials to avoid damage or disturbance. The contractor shall also maintain a register and record the description and quantity of materials drawn by him from BHEL stores and their actual utilisation. All entries made by the Contractor in the register shall be initialed by the BHEL's site Engineer. After completion of the works un-utilised instruments and associated materials shall be returned to BHEL stores and due receipt shall be obtained.

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5.0 ERECTION OF INSTRUMENTATION :

- 5.1 The Contractor shall, execute the entire instrumentation work within the battery limits as indicated in BHEL drawings and the work includes erection, testing, calibration, and commissioning of instrumentation and control panels and gauge, boards for all equipments and associated auxiliaries.
- 5.2 BHEL will furnish the contractor with necessary P&I diagrams in which all the instruments required for the safety and control of the system are shown.
- 5.3 The Contractor shall erect all local instruments and junction boxes in the field with suitable and permanent supports as per BHEL's standards. The vibration free location at which the instrument shall be erected will be indicated by BHEL site engineer.
- 5.4 The mechanical contractor will provide necessary tap off points on the machines, vessels, auxiliaries and pipe lines up to the first isolation valve. The CIE contractor shall carryout further process connection from these tap off points to various instruments like pressure gauges, pressure transmitter, differential pressure transmitters, pressure switches etc. All temperature gauges with capillary type should be mounted on separate stand and capillary to be tought by separate perforated tray.
- 5.5 The process line connections between the tap off points and the respective instruments shall be carried out in accordance with the BHEL standards provided to the contractor, or as instructed by BHEL Engineer at site.
- 5.6 The contractor shall route the process impulse lines from the respective tap off point's up to the primary instruments through the shortest possible route employing minimum number of bends. They shall be carried out with the concurrence of the BHEL site engineer.
- 5.7 The instrument air (2" header) for each services will be provided at the battery limit of the respective services. The instrumentation contractor shall route the instrument air header to the local control panels and the various local pneumatic instruments, which shall be carried out under the supervision of BHEL site Engineer.
- 5.8 The CIE contractor shall install an isolation valve and air filter regulator near the local instrument on a permanent support and carryout connections from air header to various pneumatic instruments.
- 5.9 The Contractor shall connect the primary pneumatic instruments to the secondary instruments as per the P & I diagrams by means of 6 X 1 mm PVC covered copper tubes/ S. S. tubes joined by S. S. socket weld straight coupling by Argon welding, or compression fittings as required at site.

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- 5.10 The Contractor shall plan the routing of the pneumatic impulse lines and cables with the concurrence of BHEL site Engineer. He shall carryout pre-modifications suggested by BHEL site Engineer in the layout of the pneumatic tubes and electrical cables, wherever found necessary.
- 5.11 After finalising the plan of cables and tube routing the contractor shall erect slotted sheet metal trays/angle trays as the case may be from the local instruments and junction boxes up to panels & gauge boards and from the junction boxes to the local control panels. The Contractor shall use natural bends wherever slotted sheet metal/ angle tray junctions are encountered. These cable trays shall be erected securely and shall be fixed to the walls or steel beams with proper support or with hangers. The layout shall be carried out in such a way that they should be kept away from hot ambient and it is possible to lay additional cables easily at a later date.
- 5.12 The contractor shall lay the pneumatic tubes and electrical cables on independent trays. All cables shall be taped at both ends and also strands shall be ferruled for easy testing and termination. All the tubes, cables shall be laid properly and fixed securely to the trays by means of clamps. All the junction boxes shall be numbered with paint as per the directions of BHEL site engineer.
- 5.13 Metallic tags indicating the junction box number shall be tide securely to the cable or tube at the primary elements like pressure transmitters, pressure switches, etc. and a metallic tag at the junction boxes indicating the tag number of the instrument.
- 5.14 The contractor shall connect multi-tube multi-core cables to the control panel bulk head/terminal box from the respective junction boxes. Multi-cable/multi-tube shall be laid in the same way as mentioned before, and shall be secured by cable glands/ bulk heads.
- 6.0 CONTROL PANELS & LOCAL GAUGE BOARDS :
- 6.1 Panel erection shall include chipping, leveling, grouting, fabrication of base frame if required, modifications in panel wiring if any, removal of instruments/ relays for calibration, testing and re-fixing.
- 6.2 The gauge boards, as and when received at site, shall be unloaded and cleared by the contractor and shall be immediately installed at the places meant for their installation.
- 6.3 The Contractor shall drill the required No. of holes on the gland plates of the panels and local gauge boards for the entry of electrical cable, pneumatic tubes and process impulse lines, All cables shall be provided with suitable glands for fixing the cables on to the gland plates. Any extra hole shall be plugged to avoid dust/air entry to panel.

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- 6.4 All cable and pneumatic tubes shall be identified and tagged with the instrument tag number connected to the terminal strip/bulk heads as per the panel drawings supplied to the contractor.
- 6.5 On the completion of work, painting shall be done for all carbon steel parts i.e. impulse lines instrument supports, angles cable racks after proper cleaning of their surfaces and shall be coated firstly by single coat primer and double coat of anti-corrosive paint.
- 7.0 CALIBRATION AND TESTING:
- 7.1 All the local pneumatic/ electrical instruments shall be calibrated, aligned, and set as per the data and priority given by BHEL Engineer. The calibration shall be done by the contractor in the presence of BHEL Engineer or staff deputed by BHEL Engineer. The contractor shall fill the proforma for each instrument giving the data, tag, No service, instrument make, and calibration values etc. Each proforma shall be signed by BHEL Engineer and customer's representative.
- 7.2 All the panel instruments, service wise, shall be calibrated, aligned and set as per the data given by BHEL Engineer in the order of priority. The Contractor shall fill the proforma as said above and get the signature of BHEL Engineer.
- 7.3 The calibration of all the local instruments and instruments mounted on local gauge boards and control panels shall be done in position as far as possible and any deviation shall be duly certified by BHEL Engineer.
- 7.4 All the control valves shall be checked/ calibrated for full range operation with required pneumatic/electric signal. The report shall be made and countersigned by BHEL Engineer/customer engineer.
- 7.5 All the safety valves will be removed by the mechanical contractor. The instrument contractor shall carry it to the instrument room. As advised by the BHEL Engineer the set value of safety valve is to be checked and if necessary contractor shall adjust and set the safety valve to the required value. Contractor shall fill up proforma giving the service, tag No. set value etc. and get signature from the BHEL engineer and customer's representative. After setting the safety valve shall be handed over to mechanical contractor for installation in its original position.
- 7.6 The contractor shall carry hydraulic test for all process impulse lines with 1.5 times the normal operating pressure of the line, isolating the instrument. The test pressure shall be kept remained for thirty minutes. If any leak is found in the process impulse line the contractor shall rectify the same. After rectification, hydraulic test shall be carried out once again BHEL Engineer shall certify each line after successful hydraulic test.

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- 7.7 Contractor shall fabricate/procure necessary standard equipment required for calibration of instruments.
- 7.8 All the pneumatic impulse lines shall be tested by the contractor for leakages at connections with an air/nitrogen pressure of 10kg/sq cm. or at the value advised by BHEL Engineer in the line isolating the instruments and with soap solution for loop checking. If any leakage is found contractor shall rectify the same and repeat the test. The Contractor shall take the signature of BHEL Engineer for each line after successful testing.
- 7.9 All the pneumatic air headers shall also be tested by the contractor in the same way as mentioned in 6.8.
- 7.10 All electrical cables shall be tested for continuity and insulation. Contractor shall earth the equipment and cables where ever required as per BHEL Engineer's advice.
- 8.0 PNEUMATIC LOOP CHECKING:
- 8.1 All the pneumatic loops shown in P & I schemes shall be checked / tested for their functioning. The loop shall include primary elements and final elements etc. The loop shall be checked/tested by simulating the process condition by means of variable inputs to the primary elements/transducers of any of the instrument's calibration is found drifted, the contractor shall re calibrate the instrument and check the loop again.
- 8.2 The Contractor shall check/test all panel internal connection with the help of panel drawings and if any connection found not as per the drawing he shall intimate the BHEL Engineer and shall act as per his advice regarding rectification if any.
- 9.0 PRE-COMMISSIONING AND COMMISSIONING:
- 9.1 All electrical switches connected to an trip inter lock circuit shall be checked/tested for their functioning by simulating the condition.
- 9.2 On advice of BHEL Commissioning Engineer, contractor shall put all instruments in line with the process. The Contractor shall modify the setting or ranges if any suggested by the BHEL Commissioning Engineer. During Commissioning of main equipment and system the contractor shall keep the instruments in auto control and tune them to the system requirements.
- 9.3 Before charging pneumatic supply air header, the lines shall be blown for a period specified by BHEL Engineer at full parameter and all signal tubes to be blown at least once.

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- 9.4 When the pre-commissioning activities are concluded the contractor shall render all help to BHEL Commissioning Engineer in regard to instrumentation during the commissioning of the main equipment.
- 9.5 Contractor shall co-operate with BHEL and customer in reviewing the progress and method of work.
- 10.0 Submission of Documentation includes submission of Calibration / test equipment test/ fitness certificate, field instrument calibration report, Panels/ Bus-duct/ relays test report, Erection Commissioning protocol on prescribed test format approved by BHEL/Client/ Consultant and as build drawings if any. For preparation of documentation bidder shall supply a Laptop computer with latest version software (i.e. minimum Core 2 Duo 2.4 GHz, 3 GB ram, 250 GB HDD, high bright screen of 15.4" with DVD writer) & colure printer to BHEL Site office. No separate charges will be emphasized for the same.
- 11.0 The unit rates for all items mentioned in specification number 204 covers the erection, testing, calibration, loop checking, preparation of report and commissioning etc, unless stated otherwise.
- 12.0 The necessary tools and accessories like climping material, identification tags ferrules, U clumps, bolts & nuts etc. required for laying pneumatic tubing, impulse tubing & piping, are not in BHEL scope of supply. The same has to be supplied by bidder.
- 13.0 Bidder shall agree to keep the rates valid for any variation in quantities indicated in Price Schedule.
- 14.0 Erection of instruments shall include fabrication of instrument stands and hardware like nut & bolt for mounting instruments on to stands. For Stand fabrication consumable like gas, welding rods, nuts bolts, anchor fastners etc are in bidder's scope.
- 15.0 Erection, calibration, testing, loop checking and commissioning of Local, Field and Panel mounted instruments, Relays, CTs & PTs, Panels, Valves, Junction boxes, Proximiter housings, Impulse lines, cables between local / field mounted instruments to JB's & JB's to Turbine / Generator control & relay panels. Cable trays, for Turbine and Generator and its auxiliaries. Some of the materials are to be supplied by the contractor and the same are mentioned clearly in specification No. 204.
- 16.0 Un-armoured Communication cable to be layed through GI pipes/ conduits. The GI pipe/ conduit along with the necessary fittings & supports are to be supplied by bidder. Bidder shall include the cost for the same along with cable laying

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- 17.0 Cable laying shall include drilling of gland holes, dressing & clamping of cables using Aluminum clamps on trays, glanding, tagging, ferruling, terminations & continuity checking. Consumables like Cable Gland, aluminum tags, lugs and ferrules shall be supplied by erection contractor and is deemed to be included in the unit rate quoted for the job. All cable ferruling should be printed / punched and cross ferruled. Single and loose ferruling is not acceptable.
- 18.0 For cable tray / duct erection and some instruments, mounting support structures and stands are to be fabricated as per BHEL engineer's guidelines. For this work no separate rate will be given. Hence this job including materials for support structures and stands, fasteners like nuts, bolts, washers etc., shall be included in the unit rate of cable tray/duct / instrument erection. For cable tray/duct erection the tray /duct couplers, bolts, nuts, washers etc., are to be supplied by the contractor and quote the unit rate accordingly without any extra charges for supply of these materials.
- 19.0 Mounting of loose supply items, includes termination of loose wires to the mounted items with proper ferruling and any modification of wiring with printed/punched cross ferruling if necessary or suggested by BHEL Site In-Charge/ Job Engineer as per operational requirement
- 20.0 Proximiter housing & junction boxes erection includes making of required hole for cable entry on housing, fabrication of structure for the same & painting on extractor. For fabrication of structure consumable like welding electrode, gas, nut bolt etc. including paint with primer to be supplied by bidder.
- 21.0 Installation of TSI probes shall include support tube erection, support tube modification & re-threading (if required), installation of support tubes, installation of protective flexible conduit erection and clamping using aluminum clamps. Aluminum clamps are to be provided by bidder.
- 22.0 Bidder shall make his own arrangements for material handling, shifting of materials from store to site and tools & tackles, hoisting equipment etc., during the erection period.
- 23.0 Process impulse piping & tubing includes oil, steam, condensate, cooling water and gas scheme etc. and pneumatic tubing fabrication & erection with all the fittings, valves etc., and hydraulic tests should be considered while quoting. No separate payments are envisaged for these items. Necessary tools & accessories like clamping bolts, nuts, U clamps, tags etc for laying pneumatic tubing, process impulse piping are to be arranged by the bidder. Bidder has to quote unit rates accordingly. No separate payments are envisaged for these items. Impulse tubing & piping jobs are to be carried as per enclosed BHEL "Instruments Hookup Diagrams" (Annexure-2) and "Instrument Installation Drawing" (Annexure-3).

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- 24.0 Calibration of safety relief valves and control valves, loop checking, re-fixing and commissioning is under the scope of bidder.
- 25.0 Bidder to note that the construction power and water will be provided at single point at fabrication area or at site. The successful bidder shall have to arrange necessary distribution meter, cabling etc., by himself. The bidder has to ensure that the statutory regulations are met with while executing the work. Bidder to also note that the construction power and water shall be chargeable as per BHEL client's terms and condition Rs. 3/- per unit (Rupees three per unit).
- 26.0 PAINTING: The Bidder shall consider about 5 (five) coats of painting (supply and application including the primer of Epoxy paint) for the items to be erected i.e. Instrument stands, panels, piping and auxiliaries etc., for the purpose of quotation and the work is subject to inspection / approval by BHEL's client. All piping & structural materials are to be sand blasted before painting. Sand blasting, supply and application of painting are bidders' scope. This job shall be included in the unit rates quoted and no separate payments are envisaged.
- 27.0 The bidder shall submit test and calibration reports for protection /auxiliary relays, instruments, control & safety valves, cables etc., as per the BHEL/CUSTOMER formats in five copies
- 28.0 During erection, testing, pre- commissioning and commissioning works, some repairs, rectification and modifications etc. are likely to occur. Contractor should note that they are part of erection, testing, pre-commissioning and commissioning scope. The contractor while quoting the rates should take the above into consideration and no extra payment will be entertained on this account.
- 29.0 For any extra equipment & structural the approved unit rates of erection only will be applicable, and this will not be treated as extra works for payment on man hour rates basis.
- 30.0 The bidder shall consider testing of CTs & PTs in bus duct / generator phase & neutral side terminal boxes erection. Relays & Panel instruments as a part of panel erection, testing and commissioning. No separate payments are envisaged.
- 31.0 Bidder shall consider that PLC erection & commissioning includes assembly mounting and testing of loose parts whatever supplied along with PLC cabinets. No separate payments are envisaged.
- 32.0 Bidder to note that they have to provide commissioning assistance as per the site requirement during commissioning. No separate payments are envisaged and the unit rates quoted for erection and commissioning are deemed to have taken care of this requirement. Commissioning is deemed to be completed on successful completion of 14 days reliability runs of the unit with full load.

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33.0 Segregated Phase Bus-duct and Accessories erection including erection of open bus-bar, flexible links, etc. inside generator air cooling chamber with proper support and insulator (insulators are BHEL scope of supply) fixing as per requirement, from generator terminal to Seal of bushing and testing & commissioning of the same. No separate cost emphasized for the same. Approximate lay out attached in Annexure 1

34.0 CO₂ piping erection includes fixing of CO₂ nozzle, tubing from CO₂ cylinder with tube fittings, threading, welding of pipes whichever suggested by BHEL Site-in-charge / Job engineer or Customer/ consultant representative. Tools & tackles and consumables for Carrying out the jobs to be arranged by bidder.

35.0 ACCEPTANCE OF THE TENDER

Acceptance of the tender will be intimated to the successful tenderer through a letter of intent / Fax of intent. The contractor shall then be required to execute an agreement annexed (Annexure I & II), within seven (7) days from the date of issue of the letter of Intent. In the event of failure on the part of the contractor to sign the agreement within the specified time, the earnest money deposit shall be forfeited and the acceptance of his tender shall be considered as withdrawn.

36.0 CONTENTS OF THE CONTRACT DOCUMENTS

The letter of submission of tender, notice inviting tender, scope of inquiry, Instruction to tenderers, general conditions of contract, general and technical specifications, tender proposal forms, tender drawings, contract form between the contractor and BHEL, forms of different deeds (as applicable), amendments / addenda / corrigenda and interpretations / clarifications as issued by BHEL subsequent to issues of tender documents (if any), contractor's tender No. dated all correspondences, minutes of meetings, agreed variations etc., between the tenderer and BHEL till issue of the letter of intent by BHEL, agreed quality assurance programme and time schedule network together with the letter of intent issued by BHEL, all pertaining to this tender, agreed man power deployment together with their technical qualifications etc., shall form the contract.

37.0 The contract document shall contain, the scope of inquiry, general and technical specifications and amendments / addenda / corrigenda, interpretation / clarifications issued by BHEL on technical aspects, as well as all correspondences, minutes of meetings etc., between the bidder and BHEL on technical aspects, agreed quality assurance programme, time schedules network, and the rest of documents listed in clause 35.0 above.

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38.0 The bidder shall prepare , one (1) original of Contract as described in clause 35.0, 36.0 & 37.0 above within seven (7) days of signing the contract agreement and shall arrange six (6) true copies of the contract documents free of charge within 4 weeks from the date of signing the contact agreement. After retaining one copy with them for their use, the contractor shall hand over remaining 5 copies to BHEL for their use at site & head quarters including their finance department

SAFETY:

Safety during job execution is of paramount important for BHEL. Bidders representatives shall adhere to the safety norms and requirements as mentioned in tender schedule which forms an integral part of the work order. Also an annexure covering, engineering standards and practices prevalent in works is enclosed for bidder's reference. Since the erection work shall be done close to operating plant, necessary safety / work permits shall be taken from BHEL authorized engineers before commencement of any job. Bidder shall appoint and inform BHEL site office the name & qualification of the persons who shall be responsible for safety during job execution. For safety related issues bidder safety supervisor will work in close coordination with Safety Officer authorized by customer.

SAFETY REGULATIONS

Bidder will ensure that trained men attend work in safe apparel and are provided with requisite safety appliances, tools & tackles etc. there by ensuring safe working conditions. The work to be carried out under the supervision of bidder nominated safety supervisor only. For commencement of job bidder shall used duly tested tools/ tackles/appliances as per statutes in force and a copy of test certificates shall be produced to BHEL / OPG Site engineer/ safety officer on demand. Bidder shall be solely responsible and shall ensure that all safety requirements under relevant statutes in force are complied with. In case of failure to observe the above regulations while undertaking the job BHEL/OPG Site engineer/ safety officer can order for stopping the work.

- Note:**
- 1) **Instruments used for calibration and testing should have been certified by an accredited agency, as per our quality policy. Certificate of accreditation should be valid through the period of contract.**
 - 2) **Licensed electrical supervisors should execute the work.**
 - 3) **The bidder should take necessary clearances and certificates from local/state Electrical Inspectorate. The unit rate quoted should include all type of expenses for this.**
 - 4) **BIDDER SHALL NOTE THAT TENDER HAS TO BE FILLED IN ORIGINAL SCOPE FORMAT (SPEC NO. 204) SUPPLIED BY BHEL. RE-TYPED OR FORMAT WITH CHANGES (SPEC NO. 204) WILL LEAD TO CANCELLATION OF BID.**

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ERECTION SCHEDULE

(Arasmeta Captive Power Company Pvt. Ltd.)

Spec. No.203

The Schedule for Erection, Calibration, testing, loop checking and commissioning of control Instrumentation and Electricals for Main equipment, auxiliaries and piping shall be tentatively as below:

| <u>SL.No</u> | <u>DESCRIPTION</u> | <u>DATE OF COMPLETION</u> |
|--------------|----------------------------|----------------------------|
| 1. | Start of Erection | : September 2009 |
| 2. | Commissioning of Turbine | : November 2009 |
| 3. | Load run. | : November 2009 |
| 4. | Reliability Run of 14 days | : November - December 2009 |

For the purpose of contract, the contract period shall be taken as 6 months. Completion of the work shall be as per BHEL Bar chart revised from time to time. In order to expedite the work, the contractor has to deploy manpower on two-shift basis without any extra cost to BHEL.

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**SCOPE: ERECTION, CALIBRATION, TESTING, LOOP-CHECKING & COMMISSIONING.**

| SL.NO. | DESCRIPTION | UNIT | QTY | Unit Rate | Total Cost |
|---------|--|------|-----|-----------|------------|
| 1.01.00 | LOCAL / FIELD MOUNTED INSTRUMENTS | | | | |
| 1.01.01 | PRESSURE GAUGES | NOS | 56 | | |
| 1.01.02 | TEMPERTURE GAUGES | NOS | 32 | | |
| 1.01.03 | LEVEL GAUGES | NOS | 6 | | |
| 1.01.04 | DIFFERENTIAL PRESSURE INDICATORS & SWITCHES | NOS | 2 | | |
| 1.01.05 | PRESSURE SWITCHES | NOS | 25 | | |
| 1.01.06 | LEVEL SWITCHES | NOS | 14 | | |
| 1.01.07 | LEVEL TRANSMITTER | NOS | 3 | | |
| 1.01.08 | SPEED MEASURING LOOP | NOS | 2 | | |
| 1.01.09 | VIBRATION, AXIAL DISPLACEMENT, VELOCITY PROBES | NOS | 16 | | |
| 1.01.10 | RTD | NOS | 15 | | |
| 1.01.11 | BEARING THERMOELEMENTS | NOS | 14 | | |
| 1.01.12 | THERMOELEMENTS (K-TYPE THERMOCOUPLE) | NOS | 7 | | |
| 1.01.13 | ELECTRONIC PRESUTRE TRANSMITTERS | NOS | 11 | | |
| 1.01.14 | PROXIMITTERS | NOS | 16 | | |
| 1.01.15 | THERMOWELLS | NOS | 66 | | |
| 1.01.16 | CONTROL VLVES | NOS | 8 | | |
| 1.01.17 | I/H CONVERTOR | NOS | 2 | | |
| 1.01.18 | LIMIT SWITCH | NOS | 2 | | |

Note: The above rates are exclusive of govt service taxes which are to be paid as extra.

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Spec. No.204

| SL.NO. | DESCRIPTION | UNIT | QTY | Unit Rate | Total Cost |
|---------|------------------------|------|-----|-----------|------------|
| 1.01.19 | SOLENOID VALVE | NOS | 4 | | |
| 1.01.20 | AIR FILTER REGULATOR | NOS | 14 | | |
| 1.01.21 | FLOW ELEMENT | NOS | 1 | | |
| 1.01.22 | BI-METALIC THERMOMETER | NOS | 11 | | |
| TOTAL | | | | | |

| | | | | | |
|---------|--|-----|---|--|--|
| 1.02.00 | PANELS & CUBICLES: | | | | |
| 1.02.01 | LOCAL GAUGE RACK 1700 (w) X 1500 (h) | NOS | 1 | | |
| 1.02.02 | GOVERNING CONSOLE BOARD 1300(w) X 1800(h) X 450 (d) | NOS | 1 | | |
| 1.02.03 | TURBINE CONTROL PANEL 1000 X 2300 X 800 | NOS | 1 | | |
| 1.02.04 | AUTOMETIC VOLTAGE REGULATOR 1200(L) X 2300(H) X 1200(D) | NOS | 1 | | |
| 1.02.05 | GENERATOR CONTROL PANEL 1000(L) X 2300(H) X 1000(D) | NOS | 2 | | |
| 1.02.06 | GENERATOR RELAY PANEL 800(L) X 2300(H) X 800(D) | NOS | 2 | | |
| 1.02.07 | GEAR BOX SOFT STARTER PANEL 600(L) X 1500(H) X 300(D) | NOS | 1 | | |
| 1.02.08 | DC STARTER CUBICLE FOR EOP 1500 X 600 X 2430 | NOS | 2 | | |
| 1.02.09 | GENERATOR CO2 SYSTEM WITH 10 NOS. CYLENDERS & PANEL | SET | 1 | | |
| TOTAL | | | | | |

| | | | | | |
|---------|--|-----|---|--|--|
| 1.03.00 | PANEL MOUNTED INSTRUMENTS | | | | |
| 1.03.01 | TSI RACK WITH DESK TOP PC & PRINTER | NOS | 1 | | |
| 1.03.02 | WOODWARD GOVERNOR | NOS | 1 | | |
| TOTAL | | | | | |

Note: The above rates are exclusive of govt service taxes
which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER



| SL.NO. | DESCRIPTION | UNIT | QTY | Unit Rate | Total Cost |
|--------------|--|------|-----|-----------|------------|
| 1.04.00 | JUNCTION BOXES & LOCAL CONTROL STATION (LCS): | | | | |
| 1.04.01 | ELECTRICAL JUNCTION BOXES 12 INLET / 2 OUTLET | NOS | 10 | | |
| 1.04.02 | JUNCTION BOXES 8 INLET / 2 OUTLET | NOS | 10 | | |
| 1.04.03 | WEATHER PROOF JUNCTION BOXES 12 INLET / 6 OUTLET | NOS | 12 | | |
| 1.04.04 | PROXIMITTER HOUSINGS | NOS | 11 | | |
| TOTAL | | | | | |

| | | | | | |
|--------------|---|-----|-----|--|--|
| 1.05.00 | PROCESS AND PNEUMATIC TUBING & PIPING: | | | | |
| 1.05.01 | CS PIPE 21.3 x 3.73 | MTR | 300 | | |
| 1.05.02 | Cr-Mo PIPE 21.3 x 3.73 | MTR | 200 | | |
| 1.05.03 | SS TUBE 17.1 X 1.8 | MTR | 1 | | |
| 1.05.04 | SS TUBE 12.7 x 2.1 | MTR | 500 | | |
| 1.05.05 | SS PIPE 33.4 X 3.4 | MTR | 110 | | |
| 1.05.06 | SS TUBE 6.3 X 0.9 | MTR | 280 | | |
| 1.05.07 | CS PIPE A106, 60.3 X 3.91 | MTR | 100 | | |
| TOTAL | | | | | |

| | | | | | |
|---------|---|-----|------|--|--|
| 1.06.00 | CABLES : (ERECTION, TERMINATION & TESTING): | | | | |
| 1.06.01 | 1P X 0.5 SQ.MM SIGNAL CABLE INDIVIDUAL & OVERALL SHEALD | MTR | 275 | | |
| 1.06.02 | 1P X 1.5 SQ.MM SIGNAL CABLE | MTR | 1200 | | |
| 1.06.03 | 6P X 0.5 SQ.MM SIGNAL CABLE INDIVIDUAL & OVERALL SHEALD | MTR | 550 | | |
| 1.06.04 | 1P X 1.5 SQMM K-Type T/C EXTENTION CABLE | MTR | 300 | | |
| 1.06.05 | SERIAL COMMUNICATION CABLE | MTR | 35 | | |

Note: The above rates are exclusive of govt service taxes which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER



CIE PRICE BID

(Arasmeta Captive Power Company Pvt. Ltd.)

Page
4 of 6

Spec. No.204

| SL.NO. | DESCRIPTION | UNIT | QTY | Unit Rate | Total Cost |
|--------------|------------------------------------|------|------|-----------|------------|
| 1.06.06 | 1T x 0.5 SQ MM COPPER CABLE | MTR | 220 | | |
| 1.06.07 | 2T x 0.5 SQ MM COPPER CABLE | MTR | 150 | | |
| 1.06.08 | 10T x 0.5 SQ MM COPPER CABLE | MTR | 450 | | |
| 1.06.09 | 2C X 0.75 SQMM COPPER CABLE | MTR | 200 | | |
| 1.06.10 | 3C X 4 SQ.MM COPPER CABLE | MTR | 800 | | |
| 1.06.11 | 3C X 6 SQ.MM COPPER CABLE | MTR | 500 | | |
| 1.06.12 | 5C X 2.5 SQ.MM CONTROL CABLE | MTR | 2500 | | |
| 1.06.13 | 10C X 2.5 SQ.MM CONTROL CABLE | MTR | 1200 | | |
| 1.06.14 | 3C X 2.5 SQMM COPPER CONTROL CABLE | MTR | 220 | | |
| TOTAL | | | | | |

| | | | | | |
|--------------|--|-----|-----|--|--|
| 1.07.00 | ERECTION OF CABLE TRAYS & CABLE DUCT: | | | | |
| 1.07.01 | PERFORATED CABLE TRAY L=2.5M, W=50MM | NOS | 150 | | |
| 1.07.02 | PERFORATED CABLE TRAY L=2.5M, W=150 MM | NOS | 100 | | |
| TOTAL | | | | | |

| | | | | | |
|---------|---|-----|-----|--|--|
| 1.08.00 | FABRICATION, ERECTION OF STRUCTURL STEEL : | | | | |
| 1.08.01 | STRL ST CHANNEL 100 X 50 | MTR | 11 | | |
| 1.08.02 | STRL ST CHANNEL 75 X 40 | MTR | 50 | | |
| 1.08.03 | ANGLE 50 x 50 x 6 | MTR | 11 | | |
| 1.08.04 | ANGLE 40 x 40 x 5 | MTR | 300 | | |
| 1.08.05 | PLATE 6 MM THICK 1500 x 5000 | NOS | 1 | | |

Note: The above rates are exclusive of govt service taxes which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER



CIE PRICE BID

(Arasmeta Captive Power Company Pvt. Ltd.)

Page
5 of 6

Spec. No.204

| SL.NO. | DESCRIPTION | UNIT | QTY | Unit Rate | Total Cost |
|---------|-------------------------------|------|-----|-----------|------------|
| 1.08.06 | PLATE 5 MM THICK 1000 X 1000 | NOS | 1 | | |
| 1.08.07 | PLATE 10 MM THICK 1000 X 1000 | NOS | 1 | | |
| 1.08.08 | ANGLE 25 x 25 x 3 | MTR | 100 | | |
| 1.08.09 | FLAT 20 X 5 | MTR | 38 | | |
| TOTAL | | | | | |

| | | | | | |
|---------|--|-----|----|--|--|
| 1.09.00 | SEGREGATED PHASE BUSDUCT & ACCESSORIES (Refer Spec No. 202 clause 32) | | | | |
| 1.09.01 | BUSDUCT | MTR | 30 | | |
| 1.09.02 | LAPT CUBICAL 1950(L) X 1900(D) X 2500(L) | NOS | 1 | | |
| 1.09.03 | NGR 2000(L) X 1300(D) X 1200(H) | NOS | 1 | | |
| 1.09.04 | SUPPORT STRUCTURE | TON | 2 | | |
| TOTAL | | | | | |

Note: The above rates are exclusive of govt service taxes
which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER



CIE PRICE BID

(Arasmeta Captive Power Company Pvt. Ltd.)

Page
6 of 6

Spec. No.204

SUMMARY SHEET

| | | |
|--------------------|--|--|
| 1.01.00 | LOCAL/FIELD MOUNTED INSTRUMENT 1.01.01 TO 10.01.22 | |
| 1.02.00 | PANELS AND CUBICAL 1.02.01 TO 1.02.09 | |
| 1.03.00 | PANEL MOUNTED INSTRUMENT 1.03.01 TO 1.03.02 | |
| 1.04.00 | JUNCTION BOXES & LOCAL CONTROL STATION (LCS) 1.04.01 TO 1.04.04 | |
| 1.05.00 | PROCESS AND PNEUMATIC TUBING & FITTING 1.05.01 TO 1.05.07 | |
| 1.06.00 | CABLES 1.06.00 TO 1.06.14 | |
| 1.07.00 | ERECTION OF CABLE TRAYS & CABLE DUCTS 1.07.01 TO 1.07.02 | |
| 1.08.00 | FABRICATION, ERECTION OF STRUCTURE STEEL 1.08.01 TO 1.08.09 | |
| 1.09.00 | SEGREGATED PHASE BUSDUCTS & ACCESSORIES 1.09.01 TO 1.09.04 | |
| GRAND TOTAL | | |

Note: The above rates are exclusive of govt service taxes
which are to be paid as extra.

SIGNATURE & SEAL OF BIDDER



TERMS OF PAYMENT

SECTION VIII

(Arasmeta Captive Power Company Pvt. Ltd.)

The contractor shall submit the Progress of work weekly with certification of computation of work from BHEL Site Engineer. The contractor may raise bill for the work carried out monthly as per rate accepted.

Payment to the contractor for the work done will be regulated as follows:

- a) 50% of each item will be paid on completion of the erection and calibration of the items as applicable against progressive running bills.
- b) 35% value of each item shall be paid on completion of testing, painting / final painting and putting into services as applicable against progressive running bills.
- c) 5% of the value shall be paid on submission of E & C Documentation (Calibration / test equipments fitness certificate, Protocol, test reports, as-build drawings)
- d) 5% of the value shall be paid on commissioning of set after taking into consideration total value.
- e) Final 5% of the total shall be paid after the expiry of the guarantee period. All payments shall be released from our headquarters at Hyderabad after the bills are duly certified by our Constructions Manager / Engineer.
- f) Security deposit will be deducted as per rules and paid on completion of guarantee period.

NOTE:

- 1- For supply items 85% cost of the items will be paid after receipt of material at site in good condition and acceptance there of against Progressive running bills.
- 2- Balance payments for supplies will be released as per paras (d) and (e) above.

SIGNATURE & SEAL OF BIDDER



MAN HOUR RATES

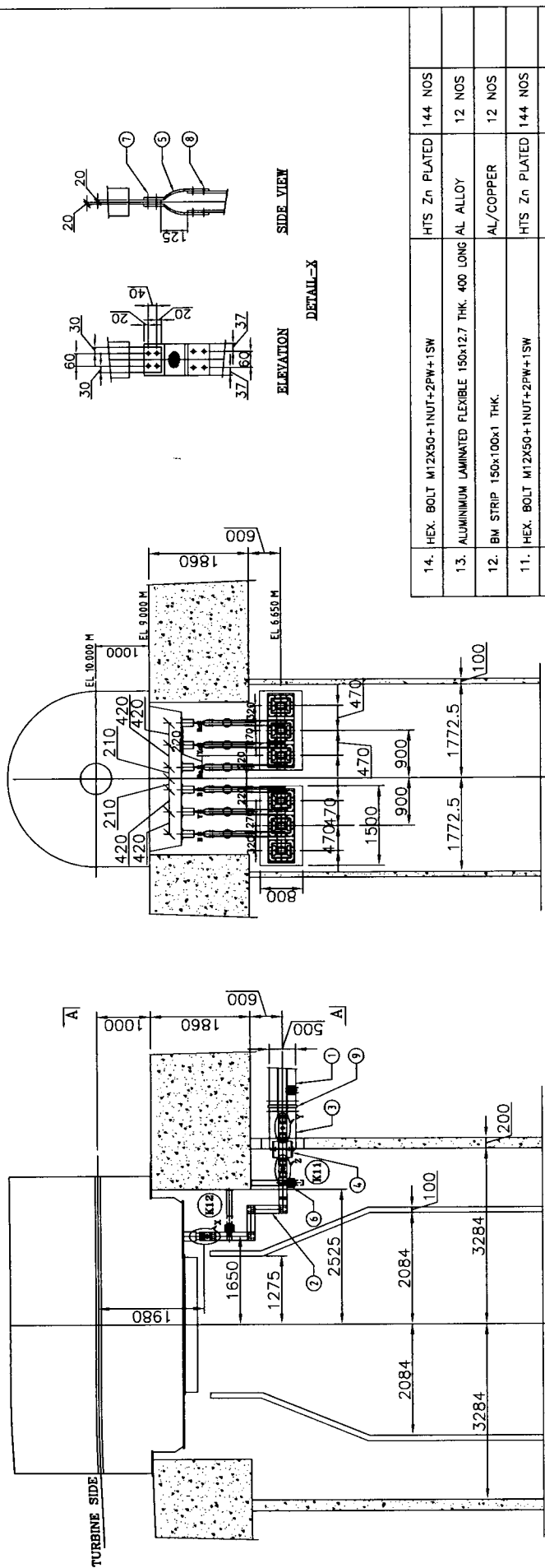
(Arasmeta Captive Power Company Pvt. Ltd.)

Spec. No.205A

Bidder shall consider the following single man-hour rate including cost of supervision and consumables for all categories of extra works that may arise during course of contract. Bidder to note that these rates shall not be applicable for, modification / rectification of works executed defectively contrary to the instructions of Engineers and drawings. Bidder to note that the same man-hour rate shall be applicable for overtime working also.

| Sl. No. | DESCRIPTION | MAN HOUR RATE |
|---------|-----------------------------------|---------------|
| 1. | SKILLED / SEMISKILLED / UNSKILLED | Rs. 25/- |

SIGNATURE & SEAL OF BIDDER



VIEW -AA

GEN. NOTES:-
 1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
 2. COPPER BUS BAR JOINTS ARE TIN PLATED.

| SL. NO. | DESCRIPTION | MATL. | QTY. | REMARKS |
|---------|--|----------------|----------------------|---------|
| 14. | HEX. BOLT M12X50+1NUT+2PW+1SW | HTS Zn PLATED | 144 NOS | |
| 13. | ALUMINIUM LAMINATED FLEXIBLE 150X12.7 THK. 400 LONG AL ALLOY | AL ALLOY | 12 NOS | |
| 12. | BM STRIP 150X100X1 THK. | AL/COPPER | 12 NOS | |
| 11. | HEX. BOLT M12X50+1NUT+2PW+1SW | HTS Zn PLATED | 144 NOS | |
| 10. | COPPER LAMINATED FLEXIBLE 150X10 THK. 325 LONG | COPPER | 12 NOS | |
| 9. | BELLOW 1400X500 | EPDM | 02 NOS | |
| 8. | HEX. BOLT M12X50+1NUT+2PW+1SW | HTS Zn PLATED | 48 NOS | |
| 7. | HEX. BOLT M12X60+1NUT+2PW+1SW | HTS Zn PLATED | 24 NOS | |
| 6. | SUPPORT INSULATORS | PORCELAIN | 12 NOS | |
| 5. | COPPER LAMINATED FLEXIBLE 150X10 THK. 285 LONG | COPPER | 12 NOS | |
| 4. | WALL FRAME WITH 3 NOS SEAL OFF BUSHINGS | AI ALLOY/EPOXY | 02 SETS | |
| 3. | ADAPTOR BOX, 3 THK. | AI ALLOY | 2 NOS | |
| 2. | BUSBAR 2-150X10 THK. FLAT (PVC SLEEVED) | COPPER | 23.004 - 1 Ph. Mtrs. | |
| 1. | ENCLOSURE 1400X500X3 THK. | AI ALLOY | --- | |

| DRN. | DATE | CUSTOMER : | JOB NO. |
|-----------------------|----------|--|--------------|
| PGN | 12.11.08 | M/S BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD | BD08-195 |
| CHD. | | CONSULTANT : AVANT GARDE ENGINEERS AND CONSULTANT PVT LTD. | SHEET NO. 05 |
| APPD. | | PROJECT : M/s ARASMETA CAPTIVE POWER CO. PVT LTD. 1 x 43 MW STG. UNIT-II | REV. NO. 00 |
| DESCRIPTION OF CHANGE | DATE | SIGN. | REV. NO. 00 |

SPACEAGE SWITCHGEARS LIMITED
 68, INDUSTRIAL DEVELOPMENT COLONY, GURGAON-122001

| REV. NO. | DESCRIPTION OF CHANGE | DATE | SIGN. | DRG. NO. | REV. NO. | REMARKS |
|----------|-----------------------|------|-------|---------------|----------|---------|
| | | | | BD08-195C-835 | | |

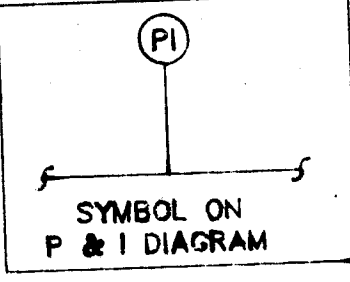
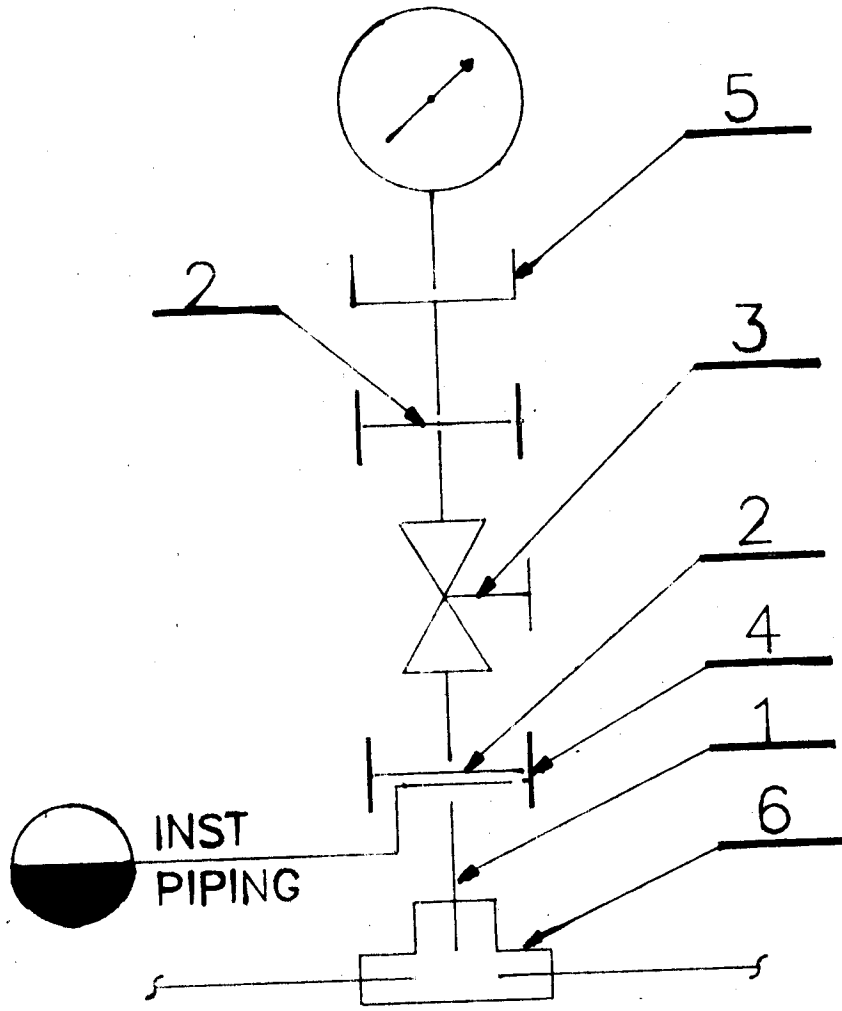
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FIRST ANGLE PROJECTION

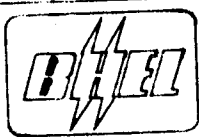
(ALL DIMENSIONS ARE IN mm)

INVENTORY NO T5GN AND DATE REF. DRG. NO. HOOKUP 2-DWG
 THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
|------|------|---------|------|------|---------|---|
| | | CHECKED | | | CHECKED | |
| | | | | | | |



| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |



BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

| | | | | |
|-------|------------|------------|----------|-------------|
| DRN. | NAME | SIGN. | DATE | NO. OF VAR. |
| | R. BIJU | <i>RBJ</i> | 13.11.93 | |
| CHD. | G.R. REDDY | <i>GR</i> | 18.12.93 | |
| APPD. | G.R. REDDY | <i>GR</i> | 18.12.93 | |

| | | | | | | |
|------------------------|--------------------------|-------------|----------------|---------------------|------------|----------------|
| DEPT. TCEI CODE 415 | GRADE OF TOL. DIM. C/M/F | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. — | ITEM NO. — | NO. OF ITEMS — |
|------------------------|--------------------------|-------------|----------------|---------------------|------------|----------------|

| | | | |
|---|-------------|---------------------------|------------------|
| TITLE LOCAL DIRECT MOUNTED PRESSURE GAUGE CONNECTION — JACKING OIL PIPE LINES | CARD CODE — | DRAWING NO. 4-31 00-50126 | REV. 00 |
| | | SHEET NO. 2 | END OF SHEETS 44 |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MILLIMETERS)

INVENTORY NO. SIGN. AND DATE. REF. DRG. NO. HOOKUP.3.DWG. THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
|------|------|---------|------|------|---------|------------------------|
| | | CHECKED | | | CHECKED | STATUS OF DRAWING |
| | | | | | | DISTRIBUTION OF PRINTS |

EXECUTION - I (CARBON STEEL)

| POS NO. | DESCRIPTION | DIMENSION | MATERIAL | CODE | QTY |
|---------|----------------------------------|---------------------------|--------------|--------------|-----|
| 1 | EXTENSION (NP 640) | M20 X 1.5 L | IS 1570 C40N | HY7316663022 | 1 |
| 2 | FLAT SEALING | ø20 | ALUMINIUM | HY7161094828 | 2 |
| 3 | PRESSURE GAUGE VALVE (NP 250) | M20 X 1.5 | A 105 | AA7316402016 | 1 |
| 4 | PRESSURE GAUGE COUPLING (NP 640) | M20 X 1.5 L | C40N | HY7316664029 | 1 |
| 5 | ADAPTOR | 1/2" NPT-F/ M20x1.5- M | A 105 | TC9756219017 | 1 |
| 6 | SPL. TEE | - | A 105 | - | 1 |

EXECUTION - II (STAINLESS STEEL)

| POS NO. | DESCRIPTION | DIMENSION | MATERIAL | CODE | QTY |
|---------|----------------------------------|---------------------------|-----------------|--------------|-----|
| 1 | EXTENSION (NP 640) | M20 X 1.5 L | STAINLESS STEEL | HY7316663411 | 1 |
| 2 | FLAT SEALING | ø20 | ALLUMINIUM | HY7161094828 | 2 |
| 3 | PRESSURE GAUGE VALVE (NP 250) | M20 X 1.5 | A182-F316 | AA7316402202 | 1 |
| 4 | PRESSURE GAUGE COUPLING (NP 640) | M20 X 1.5 L | A182-F316 | HY7316664037 | 1 |
| 5 | ADAPTOR | 1/2" NPT-F/ M20x1.5- M | A182-F321 | TC9756219025 | 1 |
| 6 | SPL. TEE | - | A182-F321 | - | 1 |

BILL OF MATERIAL FOR SHEET 2

| ITEM NO. | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT |
|----------|-------------|-------------|-------------|------|
| | | | MATL. SPEN. | QTY. |
| | | | | |



BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

| | | | | |
|-------|-------------|--------------------|----------|-------|
| DRN. | NAME | SIGN. | DATE | NLD.F |
| CHD. | R. BIJU | <i>[Signature]</i> | 18-11-93 | VAR. |
| APPD. | G. R. REDDY | <i>[Signature]</i> | 18-12-93 | |
| | G. R. REDDY | <i>[Signature]</i> | 18-12-93 | |

| | | | | | | | |
|------------|--------------------------|--|--------|-------------|-------------------|----------|-------------|
| DEPT. TCEI | GRADE OF TOL. DIM. C/M/F | | SCALE | WEIGHT (KG) | REF. TO ASSY DRG. | ITEM NO. | NLD.F ITEMS |
| 415 | | | N.T.S. | NA | | | |

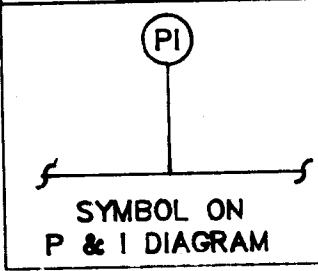
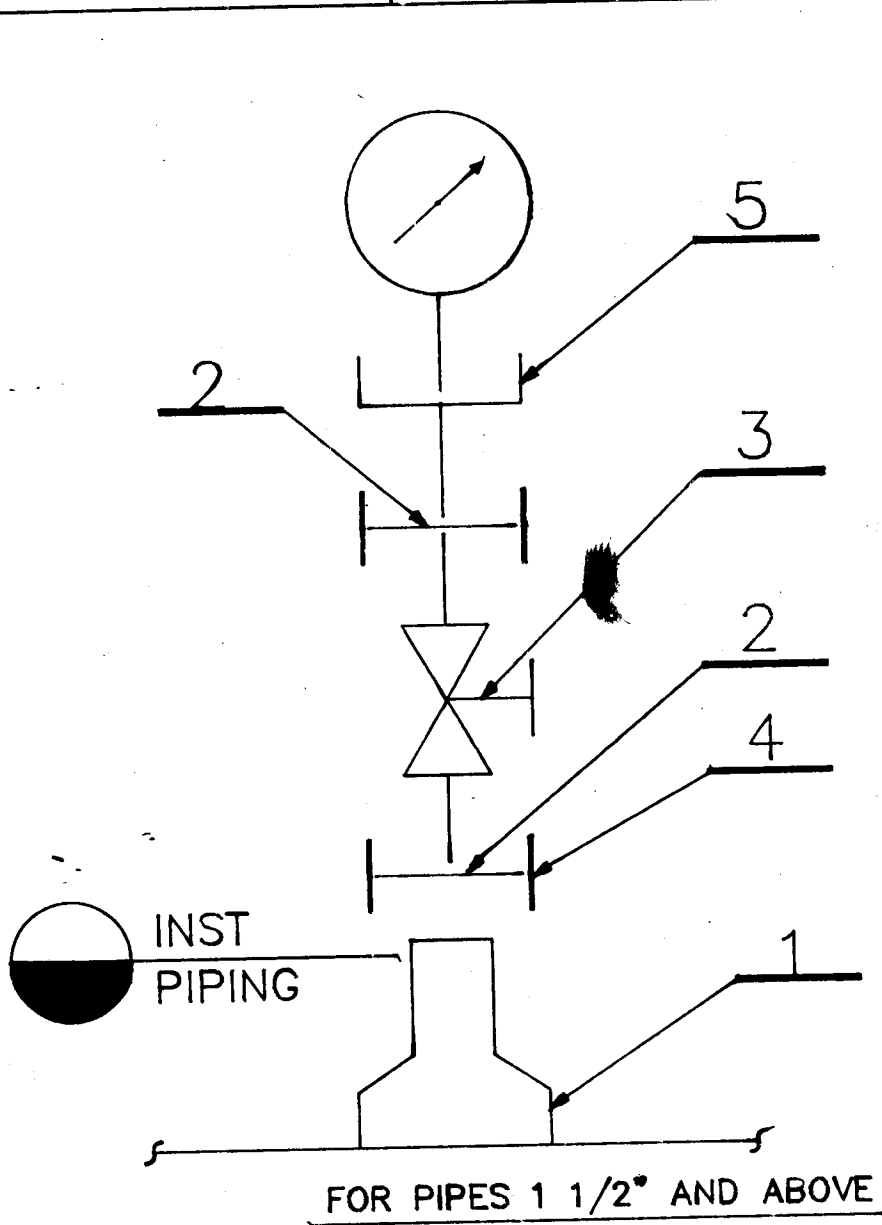
| | | | |
|------------------------------|-----------|----------------|----------------|
| TITLE | CARD CODE | DRAWING NO. | REV. |
| BILL OF MATERIAL FOR SHEET 2 | | 4-312-80-50/26 | 00 |
| | | SHEET NO. 3 | NO OF SHEETS 4 |


FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN MM)

INVENTORY NO. T.SIGN. AND DATE. REF. DRG. NO. HOOKUP B.DWG. THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

| | | | | | | |
|------|------|---------|------|------|---------|---|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
| | | CHECKED | | | CHECKED | |



| | | | | | |
|--|--------------------------|---------------------|----------------------------|----------------|-------------|
| ITEM NO. | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. | |
| | | | MATL. SPEN. | QTY. | |
|  BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | DEPT. TCEI | DRN. R.BIJU | SIGN. <i>[Signature]</i> | DATE 18-11-92 | NO. OF VAR. |
| | CODE 415 | CHD. G.R.REDDY | SIGN. <i>[Signature]</i> | DATE 18-11-93 | — |
| | GRADE OF TOL. DIM. C/M/F | APPD. G.R.REDDY | SIGN. <i>[Signature]</i> | DATE 18-11-93 | — |
| SCALE N.T.S. | WEIGHT (KG) NA | REF. TO ASSY DRG. — | ITEM NO. — | NO. OF ITEMS — | |
| TITLE LOCAL DIRECT MOUNTED PRESSURE GAUGE CONNECTION OIL, WATER, PROCESS GAS PIPE LINES (FOR 1 1/2" & ABOVE) | | CARD CODE — | DRAWING NO. 4-312-00-50126 | REV. 00 | |
| | | SHEET NO. 8 | NO OF SHEETS 44 | | |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

INVENTORY NO. SIGN. AND DATE. REF. DRG. NO. HOOKUP 9.DWG. THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
|------|------|---------|------|------|---------|---|
| | | CHECKED | | | CHECKED | |
| | | | | | | |

EXECUTION - I (CARBON STEEL)


| POS NO. | DESCRIPTION | DIMENSION | MATERIAL | CODE | QTY |
|---------|----------------------------------|---------------------------|------------|--------------|-----|
| 1 | EXTENSION (NP 640) | M20 X 1.5 L | C40N | HY7316663022 | 1 |
| 2 | FLAT SEALING | Ø20 | ALLUMINIUM | HY7161094828 | 2 |
| 3 | PRESSURE GAUGE VALVE (NP 250) | M20 X 1.5 | A 105 | AA7316402016 | 1 |
| 4 | PRESSURE GAUGE COUPLING (NP 640) | M20 X 1.5 | C40N | HY7316664029 | 1 |
| 5 | ADAPTOR | 1/2" NPT-F/ M20x1.5- M | A 105 | TC9756219017 | 1 |

EXECUTION - II (STAINLESS STEEL)

| POS NO. | DESCRIPTION | DIMENSION | MATERIAL | CODE | QTY |
|---------|----------------------------------|---------------------------|------------|--------------|-----|
| 1 | EXTENSION (NP 640) | M20 X 1.5 L | A182-F321 | TC9756216026 | 1 |
| 2 | FLAT SEALING | Ø20 | ALLUMINIUM | HY7161094828 | 2 |
| 3 | PRESSURE GAUGE VALVE (NP 250) | M20 X 1.5 | A182-F316 | AA7316402202 | 1 |
| 4 | PRESSURE GAUGE COUPLING (NP 640) | M20 X 1.5 | A182-F316 | HY7316664037 | 1 |
| 5 | ADAPTOR | 1/2" NPT-F/ M20x1.5- M | A182-F321 | TC9756219025 | 1 |

BILL OF MATERIAL FOR SHEET 8

| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |
| | | | | |

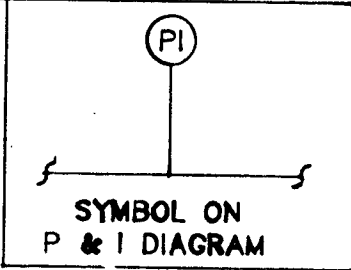
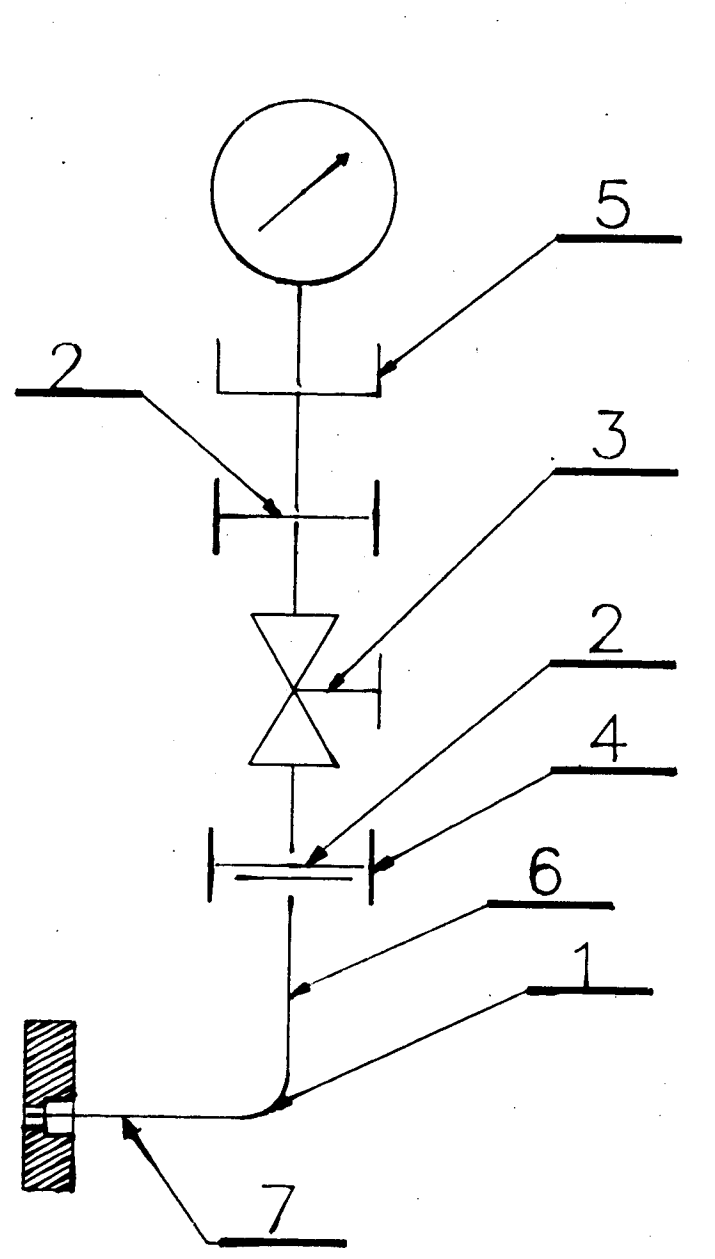
| | | | | | | | |
|---|--|-------|-------------|-------------------|--------------------|--------------|-------------|
|  | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. | R. BIJU | SIGN. | DATE | NO. OF VAR. |
| | | | CHD. | G.R. REDDY | <i>[Signature]</i> | 18.11.93 | — |
| | | | APPD. | G.R. REDDY | <i>[Signature]</i> | 18.12.93 | — |
| DEPT. CODE | GRADE OF TOL. DIM. C/M/F | SCALE | WEIGHT (KG) | REF. TO ASSY DRG. | ITEM NO. | NO. OF ITEMS | |
| 415 | | N.T.S | NA | — | — | — | |
| TITLE | | | CARD CODE | DRAWING NO. | REV. | | |
| BILL OF MATERIAL FOR SHEET 8 | | | — | 4-312-00-50126 | 00 | | |
| | | | | SHEET NO. 8 | NO OF SHEETS 24 | | |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

INVENTORY NO. SIGN. AND DATE REF. DRG. NO. HOOKUP10.DWG THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
|------|------|---------|------|------|---------|---|
| | | CHECKED | | | CHECKED | |



| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT | Qt. |
|---------|-------------|-------------|-------------|------|-----|
| | | | MATL. SPEN. | | |

| | | | | | | | |
|--|--|--------------------------|--|--|---------------------------------------|---------------|------------------------------|
| | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. R.BIJU CHD. G.R.REDDY APPD. G.R.REDDY | SIGN. <i>[Signature]</i> ROE <i>[Signature]</i> ROE <i>[Signature]</i> | DATE 18-11-93 18-12-93 18-12-93 | NO. OF VAR. — | |
| | DEPT. CODE 415 | GRADE OF TOL. DIM. C/M/F | SCALE N.T.S | WEIGHT (KG) GA | REF. TO ASSY DRG. — | ITEM NO. — | NO. OF ITEMS — |
| | TITLE LOCAL DIRECT MOUNTED PRESSURE GAUGE CONNECTION - STOP VALVE TESTER | | | CARD CODE — | DRAWING NO. 4-312-00-50126 | REV. 00 | SHEET NO. 10 NO OF SHEETS 44 |

INVENTORY NO. SIGN. AND DATE REF. DRG. NO. HOOKUP11.DWG THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

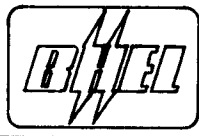
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
|------|------|---------|------|------|---------|---|
| | | CHECKED | | | CHECKED | |
| | | | | | | |

EXECUTION - I (CARBON STEEL)

| POS NO. | DESCRIPTION | DIMENSION | MATERIAL | CODE | QTY |
|---------|-------------------------------|---------------------------|-----------------|--------------|--------|
| 1 | PIPE | OD17xTHK1.7 | A312-TP 321 | AA1071155652 | 300 mm |
| 2 | FLAT SEALING | ∅20 | ALLUMINIUM | HY7161094828 | 2 |
| 3 | PRESSURE GAUGE VALVE (ND 250) | M20 X 1.5 | A 182 - F316 | AA7316402202 | 1 |
| 4 | SLIDING NUT | M20 X 1.5 | C40N | HY7316661054 | 1 |
| 5 | ADAPTOR | 1/2" NPT-F/ M20x1.5- M | STAINLESS STEEL | TC9756219025 | 1 |
| 6 | NIPPLE | 20A | C40N | HY7316662034 | 1 |
| 7 | DILO PARALLEL MALE COUPLING | R 1/2" | CS WITH SS ENDS | TC9756106069 | 1 |

BILL OF MATERIAL FOR SHEET 10

| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |



BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

| DRN. | NAME | SIGN. | DATE | NO. OF VAR. |
|-------|------------|--------------------|----------|-------------|
| | R. BIJU | <i>[Signature]</i> | 18-11-93 | |
| CHD. | G.R. REDDY | <i>[Signature]</i> | 18-11-93 | |
| APPD. | G.R. REDDY | <i>[Signature]</i> | 18-12-93 | |

| DEPT. TCEI | GRADE OF TOL. DIM. C/M/F | SCALE | WEIGHT (KG) | REF. TO ASSY DRG. | ITEM NO. | NO. OF ITEMS |
|------------|--------------------------|-------|-------------|-------------------|----------|--------------|
| 415 | | N.T.S | NA | — | — | — |

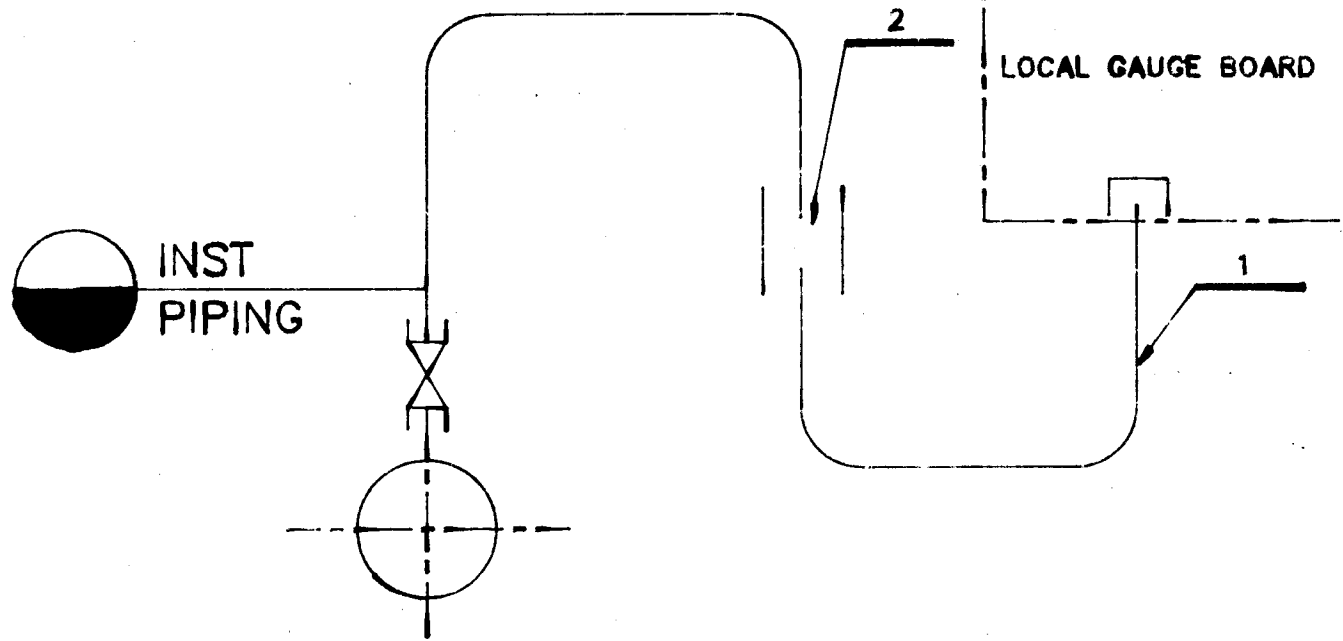
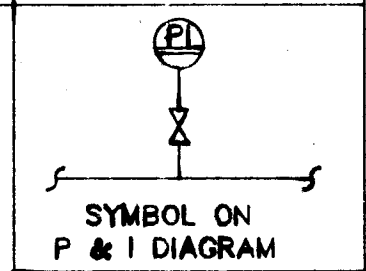
| TITLE | CARD CODE | DRAWING NO. | REV. |
|-------------------------------|-----------|----------------|-----------------|
| BILL OF MATERIAL FOR SHEET 10 | — | 4-312-00-50126 | 100 |
| | | SHEET NO. 11 | NO OF SHEETS 44 |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

INVENTORY NO. SIGN AND DATE REF. DRG. NO. HOOKUP 14.DWG THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
|------|------|---------|------|------|---------|---|
| | | CHECKED | | | CHECKED | |



| POS NO. | DESCRIPTION | DIMENSION | MATERIAL | CODE | QTY |
|---------|-------------|-------------|-------------|--------------|-----|
| 1 | PIPE | 1/2" sch 80 | SA335 GYP22 | AA1069330086 | 15M |
| 2 | COUPLING | 1/2"-6000SW | SA182 F22 | AA7242520401 | 2 |

NOTE: THIS LOOP CAN BE USED FOR TEMPERATURE BETWEEN 415°C & 550 °C

| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |



BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

| | | | | |
|-------|-----------------|-----------|----------|----------------|
| DRN. | NAME R. BIJU | SIGN. | DATE | NO. OF VAR. |
| CHD. | G.R. REDDY | <i>GR</i> | 18-11-93 | |
| APPD. | G.R. REDDY | <i>GR</i> | 18-12-93 | |

| | | | | | | | |
|---------------------|--------------------------|--|----------------|-------------------|-----------------------|---------------|-------------------|
| DEPT. TCEI CODE 415 | GRADE OF TOL. DIM. C/W/F | | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG — | ITEM NO. — | NO. OF ITEMS — |
|---------------------|--------------------------|--|----------------|-------------------|-----------------------|---------------|-------------------|

| | | | |
|---|----------------|-------------------------------|------------|
| TITLE PRESSURE GAUGE CONNECTION LGB INSTRUMENTS (STEAM, SERVICE) (ANSI RATINGS 2500) | CARD CODE — | DRAWING NO. 4-312 00-50126 | REV. 00 |
| SHEET NO. 14 | | NO OF SHEETS 44 | |

FIRST ANGLE PROJECTION

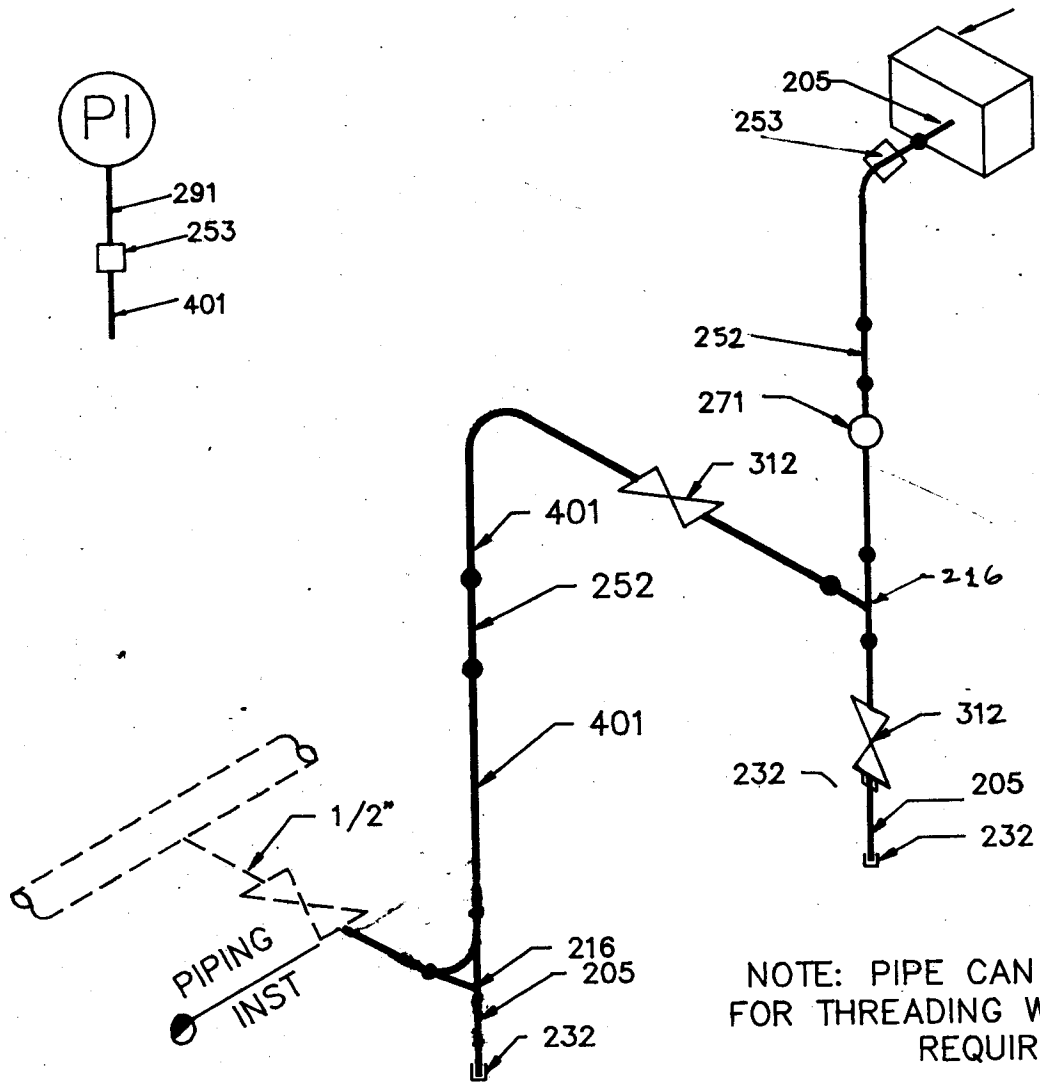
(ALL DIMENSIONS ARE IN mm)

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| | | | | | | |
|------|------|---------|------|------|---------|---|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
| | | CHECKED | | | CHECKED | |
| | | | | | | |


RATING : 600#
STEAM SERVICE

PRESSURE TRANSMITTER / PRESSURE SWITCH



NOTE: PIPE CAN BE TAPPED FOR THREADING WHERE EVER REQUIRED

SIGN AND DATE REF. DRG. NO. HOOKUP17.DWG

| | | | | |
|--|--------------------------|------------------|----------------------------|---------------------|
| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | QTY. |
| | | | MATL. SPEN. | |
|  BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. R. BIJU | SIGN. <i>RBJ</i> | DATE 18-11-93 |
| | | CHD. G.R. REDDY | SIGN. <i>GR</i> | DATE 18-12-93 |
| | | APPD. G.R. REDDY | SIGN. <i>GR</i> | DATE 18-12-93 |
| DEPT. TCEI CODE 415 | GRADE OF TOL. DIM. C/M/F | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. — |
| TITLE PRESSURE INST. CONNECTION (METER ABOVE) STEAM SERVICE | | | CARD CODE — | ITEM NO. — |
| | | | DRAWING NO. 4-312-00-50126 | NO. OF ITEMS — |
| | | | SHEET NO. 17 | REV. 00 |
| | | | NO OF SHEETS 4 | |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)



COUNTRY NO. SIGN AND DATE REF. NO. NO. IN THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY WITHOUT PERMISSION TO THE COMPANY.

| | | | | | | |
|------|------|---------|------|------|---------|------------------------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
| | | CHECKED | | | CHECKED | STATUS OF DRAWING |
| | | | | | | DEFINITION OF PRINTS |

| POS NO | DESCRIPTION | UNIT | QTY | MATERIAL CODE |
|--------|---------------------------|--------|------|---------------|
| 401 | PIPE DIA #1/2" SCH 80 | A105 B | 15 M | AA7242578040 |
| 252 | COUPLING 1/2" BW | A105 | 2 | AA7242578040 |
| 216 | FLANGE 1/2" | A105 | 2 | AA7242578040 |
| 209 | NIPPLE #1/2" NPT | A105 B | 2 | HY7242578043 |
| 232 | CAP # 1/2" NPT | A105 | 2 | HY7242578040 |
| 312 | GLOBE VALVE #1/2" SW | A105 | 2 | AA7501508585 |
| 271 | SYPHON 805 BW #1/2" BW-M | A105 | 1 | TCB755400018 |
| 291 | ADAPTOR #1/2" BW / NPTM | A105 | 1 | TC9785411020 |
| 253 | DILO COUPLING 1/2" - 3000 | 55316 | 2 | TC9785105046 |



| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT V.L. |
|---------|-------------|-------------|------------|-----------|
| | | | MATL. SPEN | QTY. |

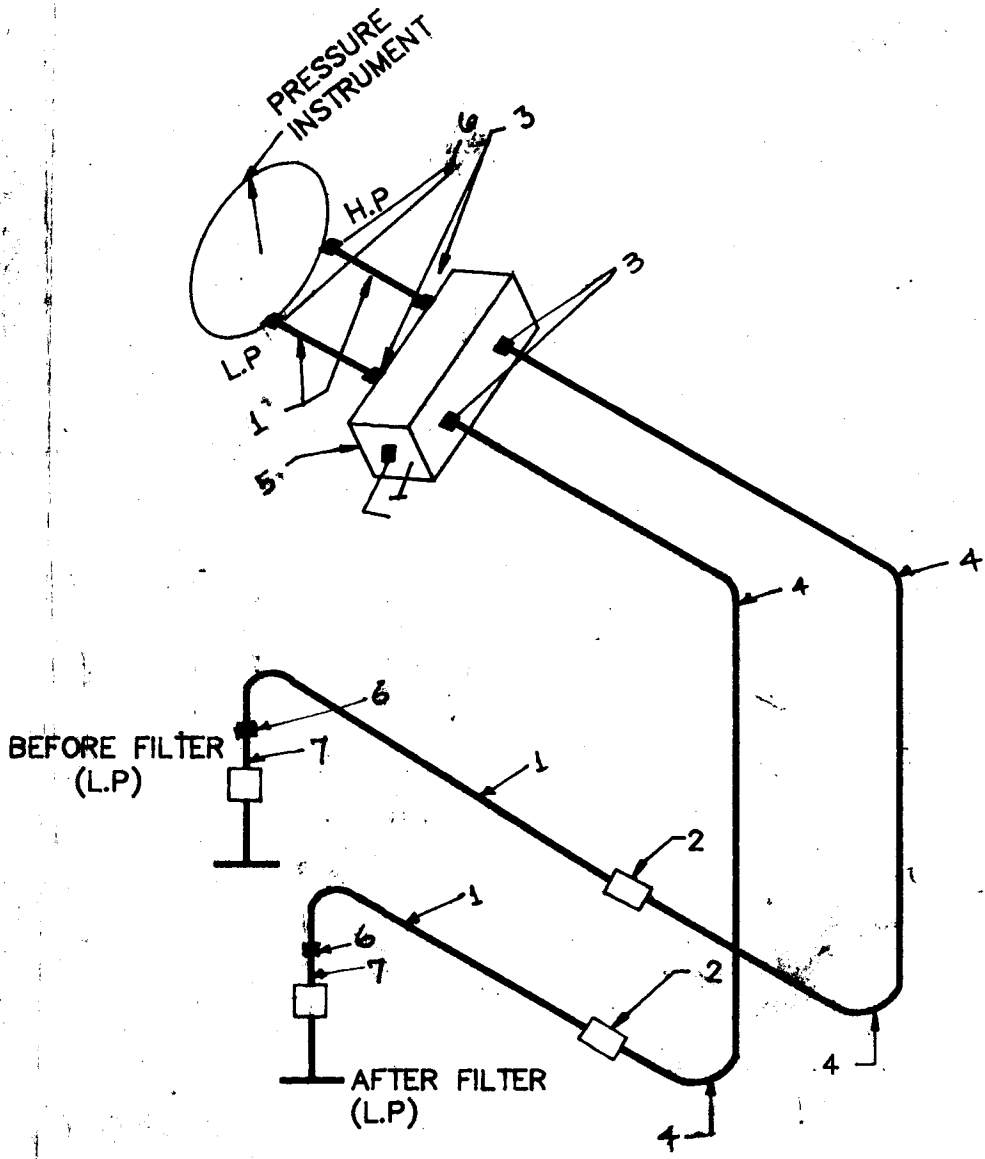
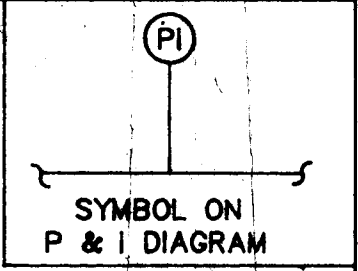
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|---|--------------------------------|---|-----------------|-------------------|-----------------------------------|------------------|-----------------|
|  | | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. R. BIJU | SIGN <i>[Signature]</i> | DATE 18-11-93 | NO. OF VAR. |
| DEPT. TCEI CODE 415 | GRADE OF TEL. DTM. C/N/E |  | SCALE N.T.S. | WEIGHT (KG) NA | REF. TO ASSY DRG | ITEM NO. | NO. OF ITEMS |
| TITLE BILL OF MATERIAL FOR SHJ 18 | | | | CARD CODE | DRAWING NO. 4-312-00-301263-00 | REV. | |
| SHEET NO. 18 | | | | NO. OF SHEETS 14 | | | |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

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| | | | | | | |
|------|------|---------|------|------|---------|------------------------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
| | | CHECKED | | | CHECKED | |
| | | | | | | STATUS OF DRAWING |
| | | | | | | DISTRIBUTION OF PRINTS |



| | | | | |
|---------|-------------|-------------|-------------|----------|
| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
| | | | MATL. SPEN. | QTY. |

| | | | | | | | |
|--|-------------------------------|--------|-------------|-------------------|--------------------|--------------|--------|
| | BHARAT HEAVY ELECTRICALS LTD. | | DRN. | NAME | SIGN. | DATE | NO. OF |
| | HYDRABAD | | CHD. | R. BIJU | <i>R. Biju</i> | 18-11-93 | VAR. |
| | | | APPD. | G. R. REDDY | <i>G. R. Reddy</i> | 18-12-93 | |
| DEPT. CODE | GRADE OF TOL. C/PT. | SCALE | WEIGHT (KG) | REF. TO ASSY DRG. | ITEM NO. | NO. OF ITEMS | |
| 415 | | N.T.S. | NA | | | | |
| TITLE | | | CARD CODE | DRAWING NO. | REV. | | |
| DIFFERENTIAL PRESSURE INDICATOR (COMMON TAPPING FOR DPS & DPI) | | | | 4-31200-50126 | 00 | | |
| | | | SHEET NO. | 25 | NO OF SHEETS | 44 | |

FIRST ANGLE PROJECTION


(ALL DIMENSIONS ARE IN mm)


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| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
|------|------|---------|------|------|---------|------------------------|
| | | CHECKED | | | CHECKED | |
| | | | | | | |
| | | | | | | DISTRIBUTION OF PRINTS |

| POS NO. | DESCRIPTION | MATL | QTY | MATERIAL CODE |
|---------|--|----------------|-----|---------------|
| 1 | SS TUBE OD = 12.7 mm t = 2.1 mm | SS 316 | 15M | HY1071090054 |
| 2 | STRAIGHT UNION (FRACTIONAL TUBE TO FRACTIONAL TUBE) | SS-810 -6 | 2 | TC9755501207 |
| 3 | 1/2" NPT-M CONNECTOR | SS-810 -1-8 | 6 | TC9755501010 |
| 4 | MALE ELBOW | SS-810 -2-8 | 4 | TC9755501452 |
| 5 | 5 WAY MANIFOLD 1/2" NPT-F | SS 316 | 1 | HY7316561017 |
| 6 | FEMALE CONNECTOR 1/2" NPT-F TO SS TUBE 12.7mm OD | SS 316 | 2 | TC9755501118 |
| 7 | NIPPLE $\phi 1/2"$ BW/NPTM | SS 316 | 2 | HY7242578841 |

| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT |
|---------|-------------|-------------|-------------|------|
| | | | MATL. SPEN. | QTY. |

| | | | | | |
|---|--|------------------|------------------|---------------|-------------|
|  | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | DRN. R. BIJU | SIGN. <i>RBJ</i> | DATE 18-11-93 | NO. OF VAR. |
| | | CHK. G.R. REDDY | SIGN. <i>GR</i> | DATE 18-12-93 | |
| | | APPD. G.R. REDDY | SIGN. <i>GR</i> | DATE 18-12-93 | |

| | | | | | | | |
|------------------------|--------------------------|---|-------------|----------------|-------------------|----------|--------------|
| DEPT. TCEI CODE 415 | GRADE OF TOL. DIM. C/M/F |  | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. | ITEM NO. | NO. OF ITEMS |
|------------------------|--------------------------|---|-------------|----------------|-------------------|----------|--------------|

| | | | |
|-----------------------------|-----------|----------------|------|
| TITLE | CARD CODE | DRAWING NO. | REV. |
| BILL OF MATERIAL FOR SHT.23 | | 4-312-0050126 | 00 |
| SHEET NO. 24 | | NO OF SHEETS 4 | |

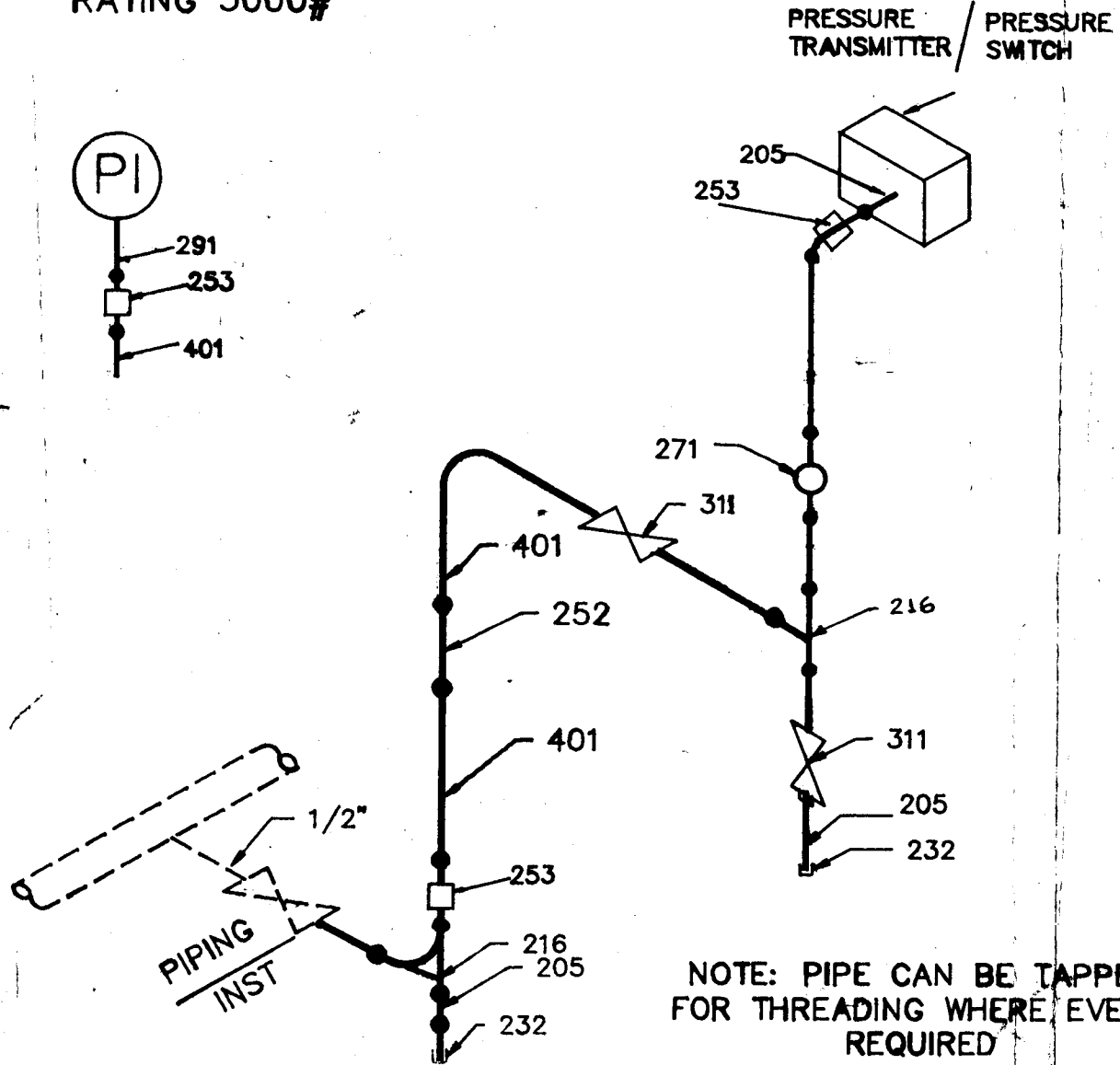
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

INVENTORY NO. SIGN. AND DATE: REF. DRG. NO. HOOKUP 27.DWG

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
|------|------|---------|------|------|---------|---|
| | | CHECKED | | | CHECKED | |
| | | | | | | |

RATING 3000#



| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Vt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |
| | | | | |

| | | | | | | | |
|--|---|-----------------------------|---|---|--|-----------------------|-------------------------------|
| | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. R. BIJU CHB. G.R. REDDY APPR. G.R. REDDY | SIGN. [Signature] [Signature] [Signature] | DATE: 18.11.93 18.11.93 18.11.93 | NO. OF VAR. — — | |
| | DEPT. TCEI CODE 415 | GRADE OF TOL. DTM. C/M/F | SCALE N.T.S. | WEIGHT (KGS) NA | REF. TO ASSY DRG. — | NO. OF ITEMS — | NO. OF ITEMS — |
| | TITLE: PRESSURE INST. CONNECTION (METER ABOVE) STEAM SERVICE | | | CARD CODE — | DRAWING NO. 4-312-00-501-66 | REV. 00 | SHEET NO. 27 NO. OF SHEETS 44 |

FIRST ANGLE PROJECTION



(ALL DIMENSIONS ARE IN mm)

INVENTORY NO T.SIGN. AND DATE REF. DRG. NO. HOOKUP28.DWG THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

| | | | | | | |
|------|------|---------|------|------|---------|------------------------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
| | | CHECKED | | | CHECKED | |
| | | | | | | STATUS OF DRAWING |
| | | | | | | DISTRIBUTION OF PRINTS |

| POS NO. | DESCRIPTION | MATL | QTY | MATERIAL CODE |
|---------|-------------------------------------|--------------|------|---------------|
| 401 | PIPE DIA 1/2" SCH80 ϕ 21.3x3.7 | SA 335GR P22 | 15 M | AA106933086 |
| 252 | COUPLING ϕ 1/2"SW-F,6000 | SA182 F22 | 2 | AA7242620401 |
| 216 | T-UNION ϕ 1/2" SW-F | SA 182 F22 | 2 | AA7242610228 |
| 205 | NIPPLE ϕ 1/2" BW/NPTM | AS | 3 | HY7242678647 |
| 232 | CAP ϕ 1/2" NPT | AS | 2 | HY7242679228 |
| 311 | GLOBE VALVE ϕ 1/2"SW-M | AS | 2 | AA7501534586 |
| 271 | SYPHON 80S BW ϕ 1/2"BW-M | SA335 GR P11 | 1 | HY7316201630 |
| 291 | ADAPTOR NPT/BWF/M ϕ 1/2"BW-F | SA335 GR P22 | 1 | TC9755411038 |
| 253 | DILCO COUPLING 1/2"-3000 | SA 182 F22 | 2 | TC9756105046 |

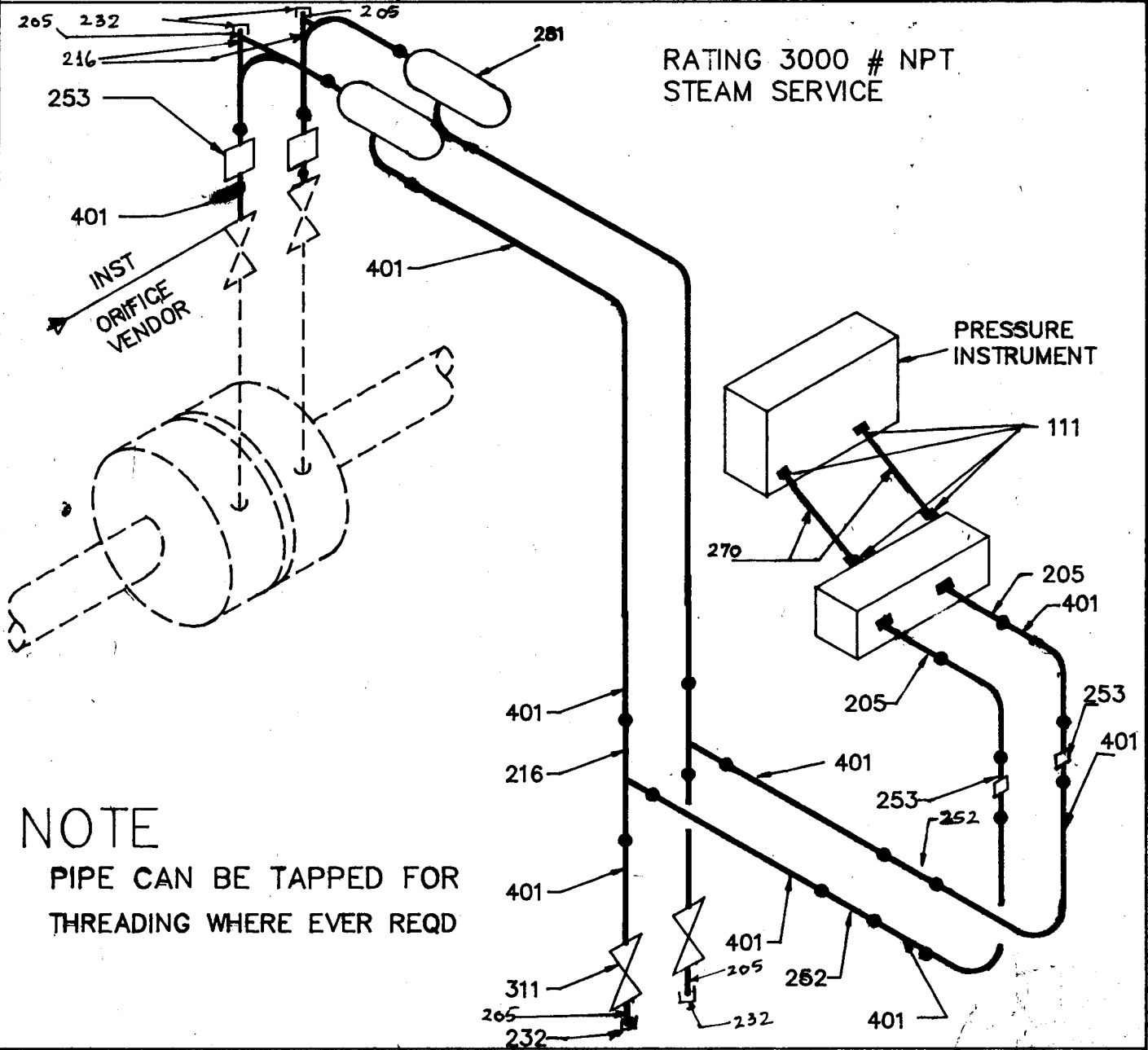
| | | | | |
|---------|-------------|-------------|-------------|----------|
| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
| | | | MATL. SPEN. | QTY. |

| | | | | | | | | |
|---|---|--|-------------------|-------------------|-------------------------------|--------------|------------------|----------------|
|  | | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. | NAME R.BIJU | SIGN. | DATE 18.11.93 | NO. OF VAR. |
| DEPT. TCEI | | GRADE OF TOL. DIM. C/M/F | SCALE N.T.S | WEIGHT (KG) NA | APPD. | G.R.REDDY | 18.11.93 | |
| CODE 415 |  | | REF. TO ASSY DRG. | ITEM NO. | NO. OF ITEMS | | | |
| TITLE BILL OF MATERIAL FOR SHT.27 | | | | CARD CODE | DRAWING NO. 4-312-00-50126 | REV. | 00 | |
| | | | | SHEET NO. | 28 | NO OF SHEETS | 44 | |

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

| | | | | | | |
|------|------|---------|------|------|---------|------------------------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
| | | CHECKED | | | CHECKED | STATUS OF DRAWING |
| | | | | | | DISTRIBUTION OF PRINTS |



NOTE

PIPE CAN BE TAPPED FOR THREADING WHERE EVER REQD

| | | | | |
|----------|-------------|-------------|-------------|----------|
| ITEM NO. | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT WT. |
| | | | MATL. SPEN. | QTY. |

| | | | | | | | |
|---|--|--------------|----------------|----------------------------|--------------------|-------------|--------------|
| | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. | NAME | SIGN. | DATE | NO. OF |
| | | | CHD. | R. BIJU | <i>[Signature]</i> | 18.11.93 | VAR. |
| | | | APPD. | G.R. REDDY | <i>[Signature]</i> | 18.12.93 | |
| DEPT. TCEI CODE 415 | GRADE OF TOL. DIM. C/M/F | SCALE N.T.S. | WEIGHT (KG) NA | REF. TO ASSY DRG. | | ITEM NO. | NO. OF ITEMS |
| TITLE FLOW INSTRUMENT - DPT (METER BELOW) STEAM SERVICE | | | CARD CODE | DRAWING NO. 4-312-00-50126 | | REV. | |
| | | | | SHEET NO. 29 | | NO OF SHEET | |

FIRST ANGLE PROJECTION



(ALL DIMENSIONS ARE IN mm)

INVENTORY NO. SIGN AND DATE REF. DRG. NO. HOOKUP30.DWG THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

| | | | | | | |
|------|------|---------|------|------|---------|------------------------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
| | | CHECKED | | | CHECKED | STATUS OF DRAWING |
| | | | | | | DISTRIBUTION OF PRINTS |

| POS NO. | DESCRIPTION | MATL | QTY | MATERIAL CODE |
|---------|-------------------------------------|--------------|------|---------------|
| 401 | PIPE DIA 1/2" SCH 80 Ø21.3 x 3.7 | SA335 GR P22 | 15 M | AA1069330088 |
| 252 | COUPLING Ø 1/2" SW-F | SA182 F 22 | 4 | AA7242520401 |
| 216 | T-UNION Ø 1/2" SW-F | SA182 F 22 | 4 | AA7242510228 |
| 205 | NIPPLE Ø 1/2" BW/NPTM | AS | 6 | HY7242578647 |
| 232 | CAP Ø 1/2" NPT | AS | 4 | HY7242579228 |
| 311 | GLOBE VALVE Ø1/2"SW-F | AS | 2 | AA7561534586 |
| 301 | 5 WAY MANIFOLD Ø1/2"NPT-F | SS316 | 1 | HY7316561017 |
| 281 | CONDENSATE POT Ø1/2"SW-F | SS316 | 2 | TC9755535022 |
| 253 | DILO COUPLING Ø1/2"BW-M | SA182 F 22 | 4 | TC9756105048 |
| 270 | SS TUBE OD-12.7 MM t=2.1MM | SS 316 | 2M | HY1071090034 |
| 111 | MALE CONNECTOR Ø 1/2" NPT-M | SS 316 | 4 | TC9755501010 |

| | | | | |
|----------|-------------|-------------|-------------|----------|
| ITEM NO. | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
| | | | MATL. SPEN. | QTY. |

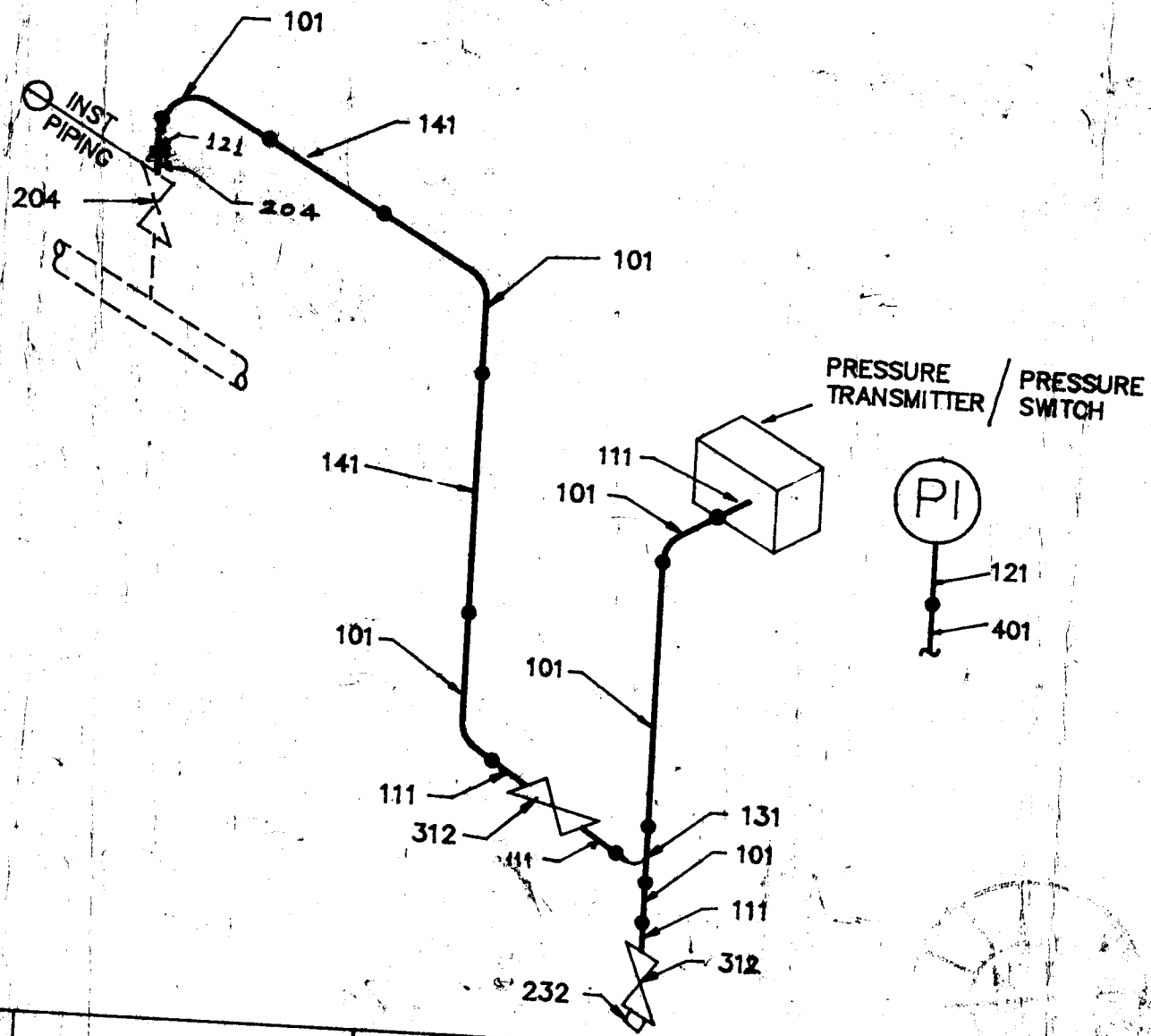
| | | | | | | | |
|---|--|---|----------------|-------------------|-------------------------------|------------------|----------------|
|  | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. | NAME R.BIJU | SIGN. <i>R.Biju</i> | DATE 18-11-93 | NO. OF VAR. |
| | | | CHD. | G.R.REDDY | <i>GR</i> | 18-12-93 | |
| | | | APPD. | G.R.REDDY | <i>GR</i> | 18-12-93 | |
| DEPT. CODE 415 | GRADE OF TOL. DIM. C/M/F |  | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. | ITEM NO. | NO. OF ITEMS |
| TITLE BILL OF MATERIAL FOR SHT.29 | | | | CARD CODE | DRAWING NO. 4-312-00-50126 | REV. | 00 |
| | | | | SHEET NO. | 30 | NO OF SHEETS | 4 |

FIRST ANGLE PROJECTION

Annexure (A) 2 (ALL DIMENSIONS ARE IN mm)

NOT BE MADE DETRIMENTAL TO THE INTEREST OF THE COMPANY

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
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| | | CHECKED | | | CHECKED | |



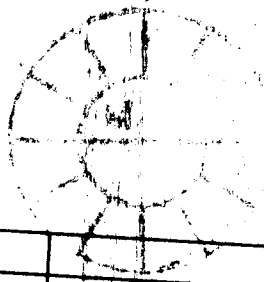
| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT WT. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |

| | | | | | | | | |
|--|-----------------------------|--|----------------|-------------------|-------------------------------|-----------|------------------|------------|
| | | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. CHD. | NAME R. BIJU G.R. REDDY | SIGN. | DATE 18-12-93 | HOLD/ VAR. |
| PT. NO. DE 415 | GRADE OF TOL. DIM. C/M/F | | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. | ITEM NO. | HOLD/ ITEMS | |
| TITLE PRESSURE INST. CONNECTION (FEET BELOW) GAS/LIQUID/COND./ STEAM/OIL SERVICE | | | | CARD CODE | DRAWING NO. 4-31250-50 | | | |
| | | | | SHEET NO. 33 | NO. OF SHEETS | | | |

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINT |
|------|------|---------|------|------|---------|--|
| | | CHECKED | | | CHECKED | |

| POS NO. | DESCRIPTION | MATL | QTY | MATERIAL CODE |
|---------|-------------------------------------|--------|-----|---------------|
| 101 | STAINLESS STEEL TUBE Ø12.7 x 2.1 | SS 304 | 15M | HY1071090054 |
| 111 | MALE CONNECTOR Ø1/2" NPT-M | SS 316 | 4 | TC9755501010 |
| 121 | FEMALE CONNECTOR Ø 1/2" NPT-F | SS 316 | 2 | TC9755501118 |
| 131 | T-UNION Ø12.7 OD | SS 316 | 1 | TC9755501304 |
| 141 | STRAIGHT UNION Ø12.7 OD | SS 316 | 2 | TC9755501207 |
| 204 | NIPPLE 1/2" NPT/BW | SS 316 | 1 | HY72425842841 |
| 232 | PLUG Ø1/2" NPT-M | SS 316 | 1 | HY7242584280 |
| 312 | NEEDLE VALVE Ø1/2" NPT-F | SS 316 | 2 | TCN731640006 |



| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |



BHARAT HEAVY ELECTRICALS LTD.
HYDERABAD

| | | | | | | | | | |
|--------------------------------------|-----------------------------|-----------------|--------------------|----------------------|-------------------|------------------------------|-------------------|------------------|------------|
| DEPT. CODE TCEI 415 | GRADE OF TOL. DIM. C/M/F | SCALE N.T.S. | WEIGHT (KGS) NA | DRN. NAME R. BIJU | CHD. G.R. REDDY | APPD. G.R. REDDY | SIGN. [Signature] | DATE 18-11-22 | NL OF VAR. |
| TITLE BILL OF MATERIAL FOR SHT.33 | | | | CARD CODE | REF. TO ASSY DRG. | DRAWING NO. 4-31200-50126 | ITEM NO. | NL OF ITEMS | REV. |
| | | | | SHEET NO. 34 | | NO OF SHEETS | | | |

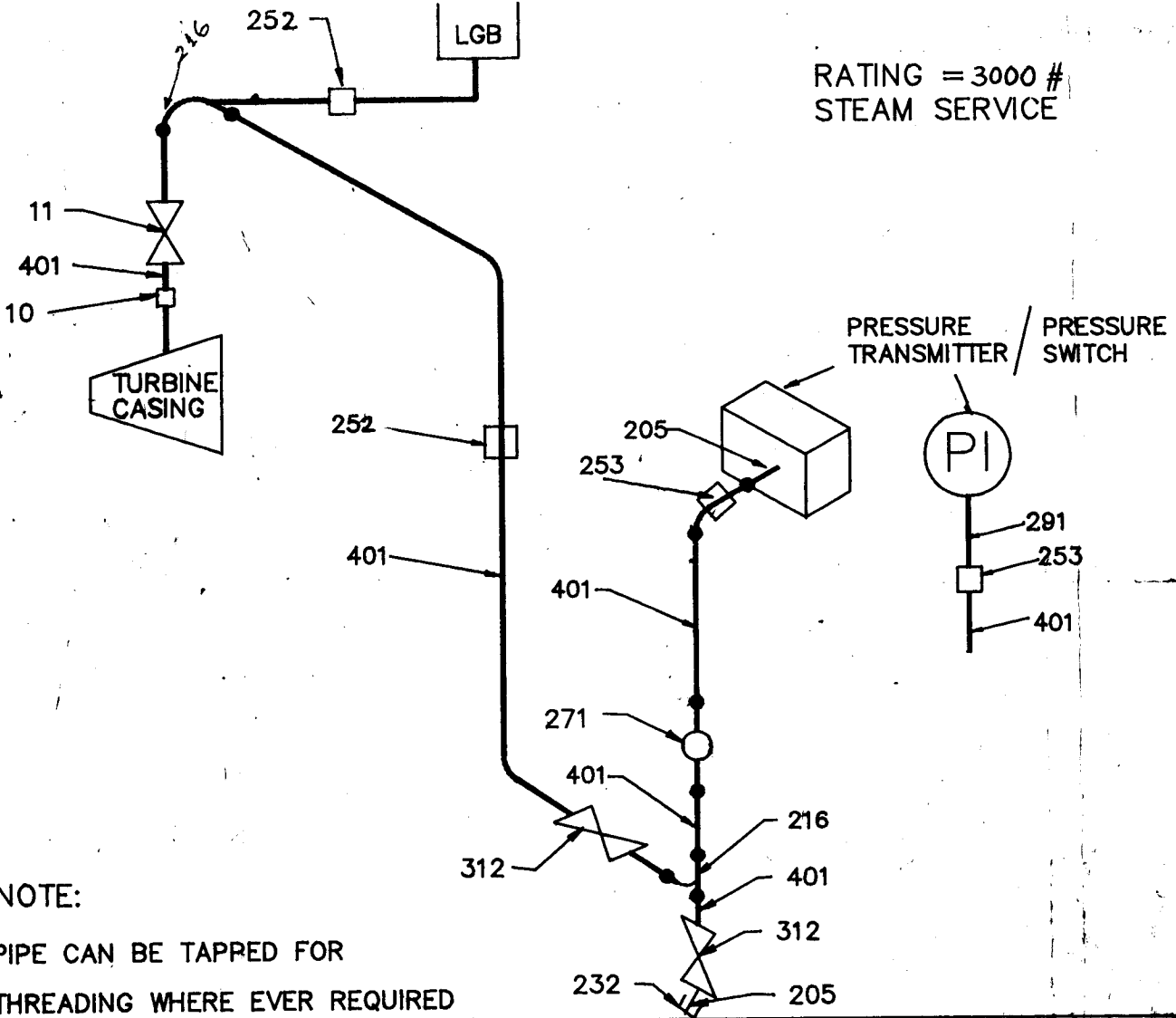
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

| | | | | | | |
|------|------|---------|------|------|---------|-------------------------|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION |
| | | CHECKED | | | CHECKED | |
| | | | | | | STATUS OF DRAWING |
| | | | | | | DISTURIBUTION OF PRINTS |

THIS LOOP IS SUITABLE FOR TEMPERATURE BETWEEN 415 °C AND 550 °C

RATING = 3000 #
STEAM SERVICE



NOTE:
PIPE CAN BE TAPPED FOR
THREADING WHERE EVER REQUIRED

| | | | | |
|----------|-------------|-------------|-------------|------|
| ITEM NO. | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT |
| | | | MATL. SPEN. | |

| | | | | | | |
|---|--------------------------|--|----------------|----------------------|-------------------------------|-------------------------|
| | | BHARAT HEAVY ELECTRICALS LTD. HYDERABAD | | DRN. NAME R. BIJU | SIGN. <i>Roe</i> | NO. 1809 |
| DEPT. TCEI CODE 415 | GRADE OF TOL. DIM. C/M/F | | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. — | ITEM NO. / NO. OF ITEMS |
| TITLE PRESSURE GAUGE CONNECTION ANSI RATINGS - 2500 (FOR WHEEL CHAMBER MEASUREMENT) | | | | CARD CODE — | DRAWING NO. 4-312-00-50126 | REV. 00 |
| | | | | SHEET NO. 43 | NO OF SHEETS 44 | |

IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

BOOKUP 41.DWG

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)



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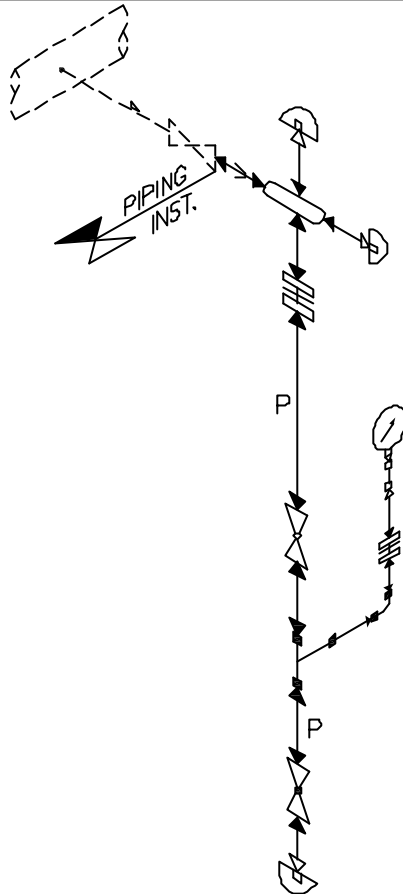
| | | | | | | |
|------|------|---------|------|------|---------|---|
| REV. | DATE | ALTERED | REV. | DATE | ALTERED | ADDITIONAL INFORMATION STATUS OF DRAWING DISTRIBUTION OF PRINTS |
| | | CHECKED | | | CHECKED | |
| | | | | | | |

| POS NO. | DESCRIPTION | MATL | QTY | MATERIAL CODE |
|---------|--------------------------------------|------------|------|---------------|
| 11 | GATE VALVE 1/2"SW 2500# | A.S | 1 | AA7501534586 |
| 10 | COUPLING 13.5x1.8SW/ 21.3x3.73 SW | A.S | 1 | HY1060266180 |
| 401 | PIPE DIA 1/2"SW #21.3X3.7 | SA335GrP22 | 30 M | AA1069330086 |
| 252 | COUPLING #1/2"SW-F | SA335GrP22 | 3 | AA7242520401 |
| 216 | T-UNION #1/2"SW-F | A.S | 2 | AA7242510228 |
| 205 | NIPPLE #1/2"BW/NPT-M | A.S | 2 | HY7242578647 |
| 232 | CAP #1/2"NPT | A.S | 1 | HY7242579228 |
| 312 | GLOBE VALVE #1/2"SW-M | A.S | 2 | AA7501534586 |
| 271 | SYPHON #1/2"BW-M | A.S | 1 | HY7316201630 |
| 291 | ADAPTOR #1/2"NPT-F/1/2"BW | A.S | 1 | TC9755411038 |
| 253 | DILLO COUPLING 1/2" | A.S | 2 | TC9756105046 |

THE INFORMATION ON THIS DRAWING IS TO BE USED DIRECTLY IN THE FABRICATION OF THE PARTS AND NOT AS A REFERENCE TO THE DRAWING

| ITEM NO | DESCRIPTION | DRAWING NO. | MATL. CODE | UNIT Wt. |
|---------|-------------|-------------|-------------|----------|
| | | | MATL. SPEN. | QTY. |

| | | | | | | | |
|---|-------------------------------|---|----------------|-------------------|------------------------------|---------------|--------------|
|  | BHARAT HEAVY ELECTRICALS LTD. | | DRN. | NAME | SIGN. | DATE | NO. OF |
| | HYDERABAD | | CHD. | G.R. REDDY | <i>[Signature]</i> | 18-11-93 | 1 |
| | | | APPD. | G.R. REDDY | <i>[Signature]</i> | 18-12-92 | 1 |
| DEPT. CODE 415 | GRADE OF TOL. DIM. C/M/F |  | SCALE N.T.S | WEIGHT (KG) NA | REF. TO ASSY DRG. — | ITEM NO. | NO. OF ITEMS |
| TITLE BILL OF MATERIAL FOR SHT.43 | | | | CARD CODE | DRAWING NO. 4-31200-50126 | REV. | |
| | | | | | SHEET NO. 44 | NO. OF SHEETS | |



NOTES:

1. INSTRUMENT ORIENTATION SHALL BE SUITABLE FOR METER READING ACCESIBILITY SUITABLE SPACE SHALL BE PROVIDED FOR MAINTENANCE ACCESIBILITY.
2. THE ORIENTATION OF TAPPING FROM PROCESS PIPE (VERTICAL/HORIZONTAL) SHALL BE SELECTED SUCH THAT PRESSURE GAUGE SHALL BE ACCESSIBLE FOR MAINTENANCE

LIST OF ITEMS

| | ITEM NO. | DESCRIPTION | SIZE | ENDS | QTY | UNIT | |
|--------|----------|---------------------|-----------|---------|-----|------|--|
| SYMBOL | A 1 | PIPE | 1/2" | PL | 10 | m | |
| ↔ | A 7 | NIPPLES | 1/2" | TH x PL | 4 | No | |
| □-□ | A 14 | STRAIGHT COUPLING | 1/2" | THXTH-F | 1 | No | |
| ↔↔ | A 15 | SWAGE NIPPLE | 3/4"x1/2" | PL x PL | 1 | No | |
| ⊥ | A 22 | EQUAL TEE | 1/2" | SW | 2 | No | |
| ⊗ | A 39 | GLOBE VALVE | 1/2" | SW | 1 | No | |
| | A 41 | FLANGE | 1/2" | WNRF | 2 | No | |
| | A 61 | MSW GASKET | 1/2" | - | 1 | No | |
| - | A 71 | STUD WITH TWO NUTS | M12x80 | - | 4 | No | |
| ⊂ | A 51 | CAP | 1/2" | TH | 3 | No | |
| ⊂ | A 10 | CONDENSING SEAL POT | 1/2" | SW | 1 | No | |
| ⊂ | A 12 | ELBOW | 1/2" | SW | 1 | No | |
| | A 113 | PIPE U-CLAMP | 1/2" | TH | 6 | NO | |
| ⊗ | A 40 | GATE VALVE | 1/2" | SW | 1 | No | |



SERVICE

STEAM

INSTALLATION:

INST. TYPE:

PR. RATING:

REMOTE-ON PIPE METER BELOW

PRESSURE GAUGE

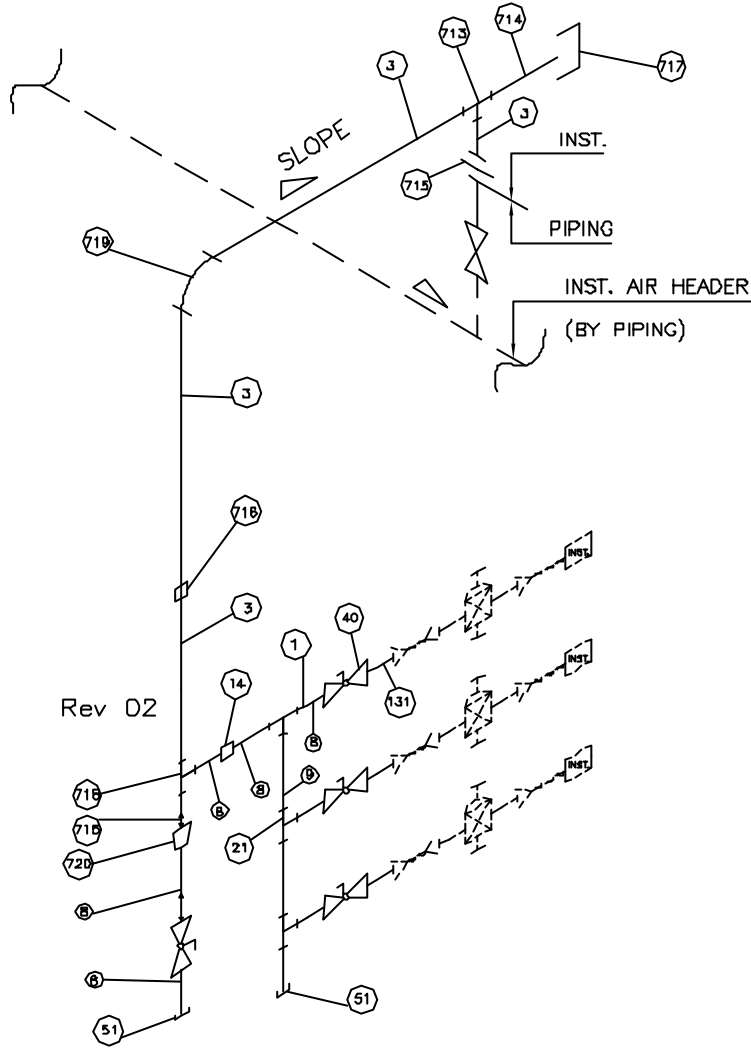
LOW PRESSURE (UPTO 600#)

STANDARD

DRG.NO.:4-38121-02446

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REV 00



NOTE:

INST. AIR SUPPLY TAKE-OFF WITH 1" NIPPLE & CAP SCRD, ARE IN PIPING SCOPE OF SUPPLY(TYPICAL)

LIST OF ITEMS

| SYMBOL | ITEM NO. | DESCRIPTION | SIZE | ENDS | QTY | UNIT | MATL. CODE | REMARKS |
|--------|----------|----------------|----------------|-------|-----|------|------------|---------|
| | S 1 | PIPE | 1/2" | | 5 | mtr | | |
| | S 713 | EQ.TEE SCRD. | 1" | TH | 1 | No. | | |
| | S 714 | NIPPLE | 1",L=100mm | TH | 1 | No. | | |
| | S 716 | COUPLING SCRD. | 1" | TH | 1 | No. | | |
| | S 717 | CAP SCRD | 1" | TH | 1 | No. | | |
| | S 718 | UNEQUAL TEE | 1"x1"x1/2" | TH | 1 | No. | | |
| | S 719 | ELBOW SCRD | 1"x1" | TH | 1 | No. | | |
| | S 720 | REDUCER SCRD | 1"x1/2" | SW | 1 | No. | | |
| | S 8 | NIPPLE | 1/2",L=100 | TH | 10 | No. | | |
| | S 14 | COUPLING SCRD | 1/2" | TH | 1 | No. | | |
| | S 51 | CAP SCRD. | 1/2" | TH | 2 | No. | | |
| | S 131 | MALE CONNECTOR | 1/2"x 6 mm | TH | 6 | No. | | |
| | S 3 | PIPE | 1" | | 5 | mtr | | |
| | S 715 | NIPPLE | 1" | THXSW | 2 | No. | | |
| | S 40 | BALL VALVE | 1/2" SCRD | TH | 6 | No. | | |
| | S 21 | EQ. TEE SCRD | 1/2"x1/2"x1/2" | TH | 5 | No. | | |
| | S 113 | PIPE CLAMP | 1.2" | TH | 6 | NO | | |
| | S 114 | U-BOLTS | 1" | TH | 4 | NO | | |



STANDERD

TITLE:
INSTRUMENT AIR
SUPPLY DISTRIBUTION SCHEME
AND MATERIAL TAKE OFF

DRG.NO.:4-38121-02446

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REV 00